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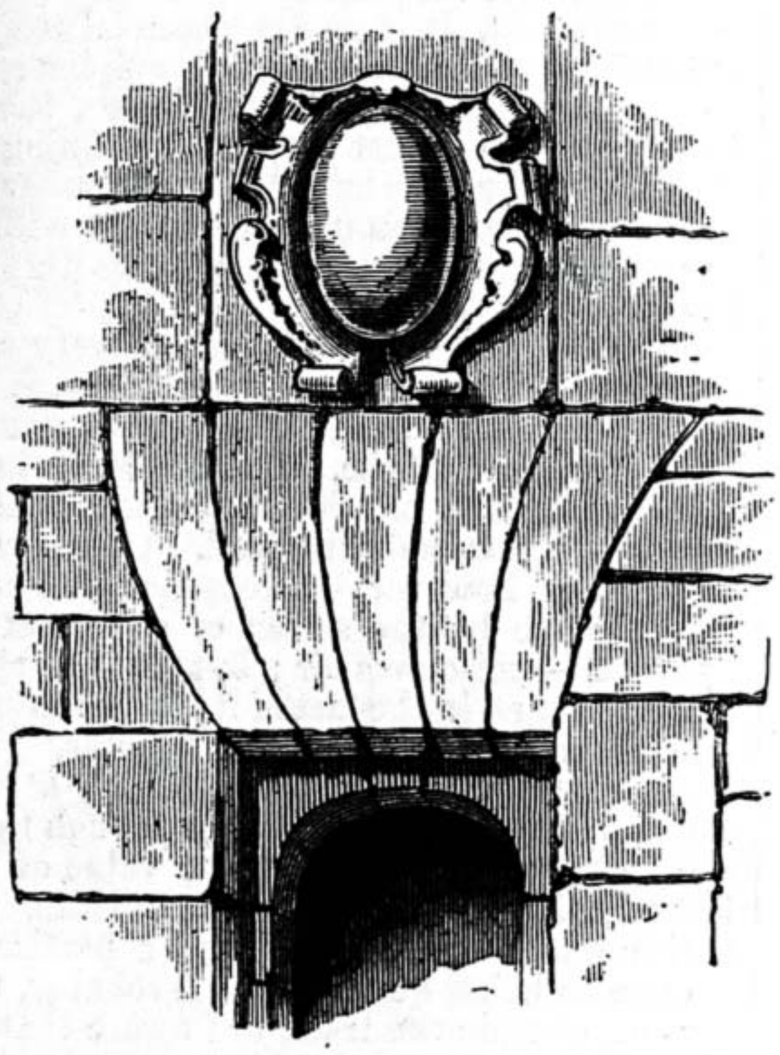

Fig. 1.—Arch in the Calle de la Madre de Dios, Murcia.

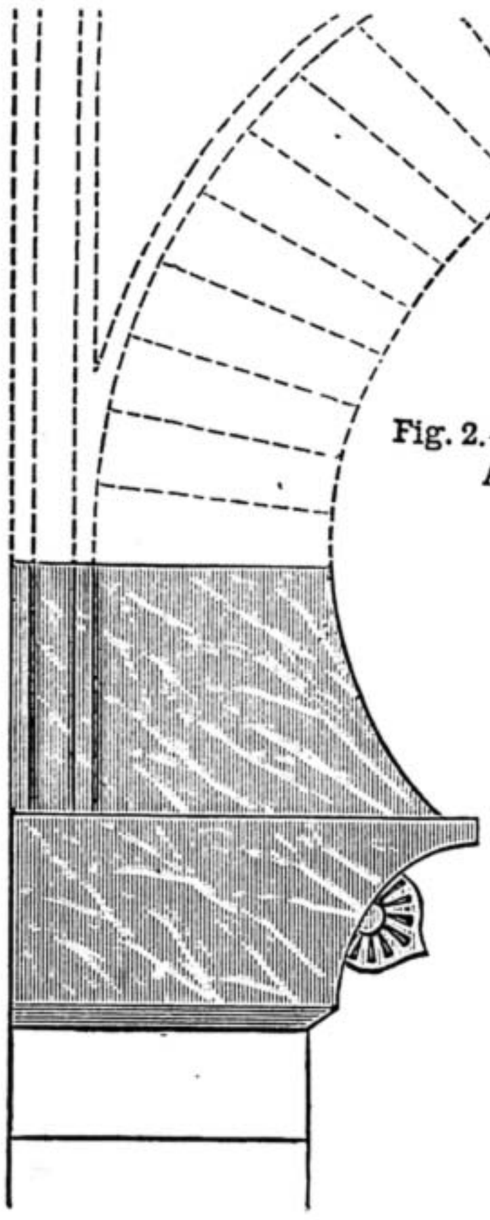

Fig. 2.—Peculiar Moorish Arch, Murcia.

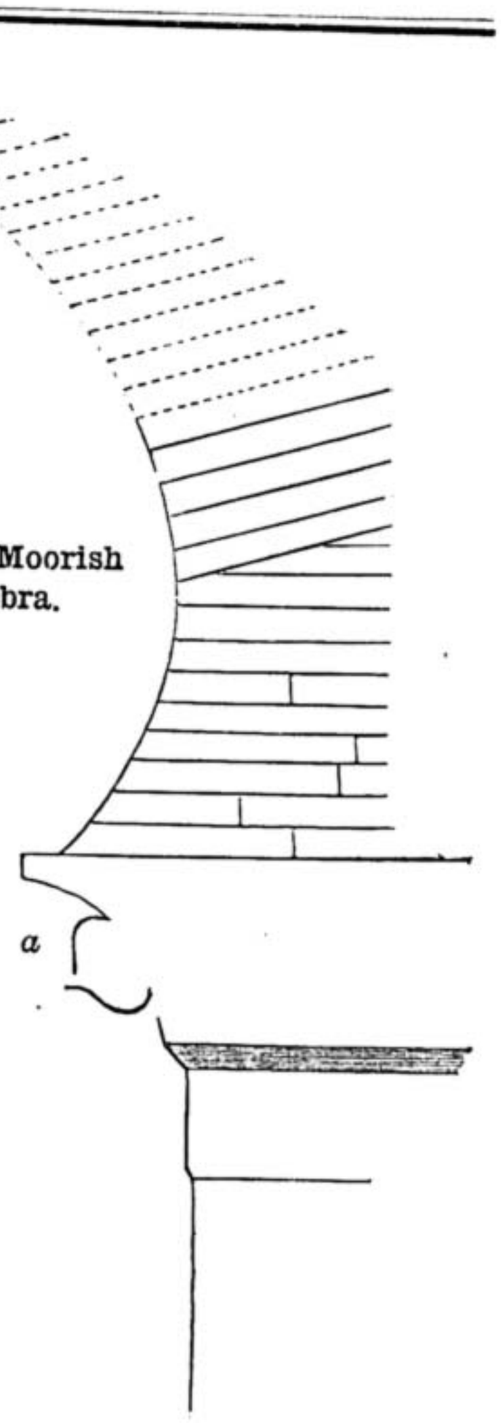

Fig. 3.—Ordinary Moorish Arch: Alhambra.

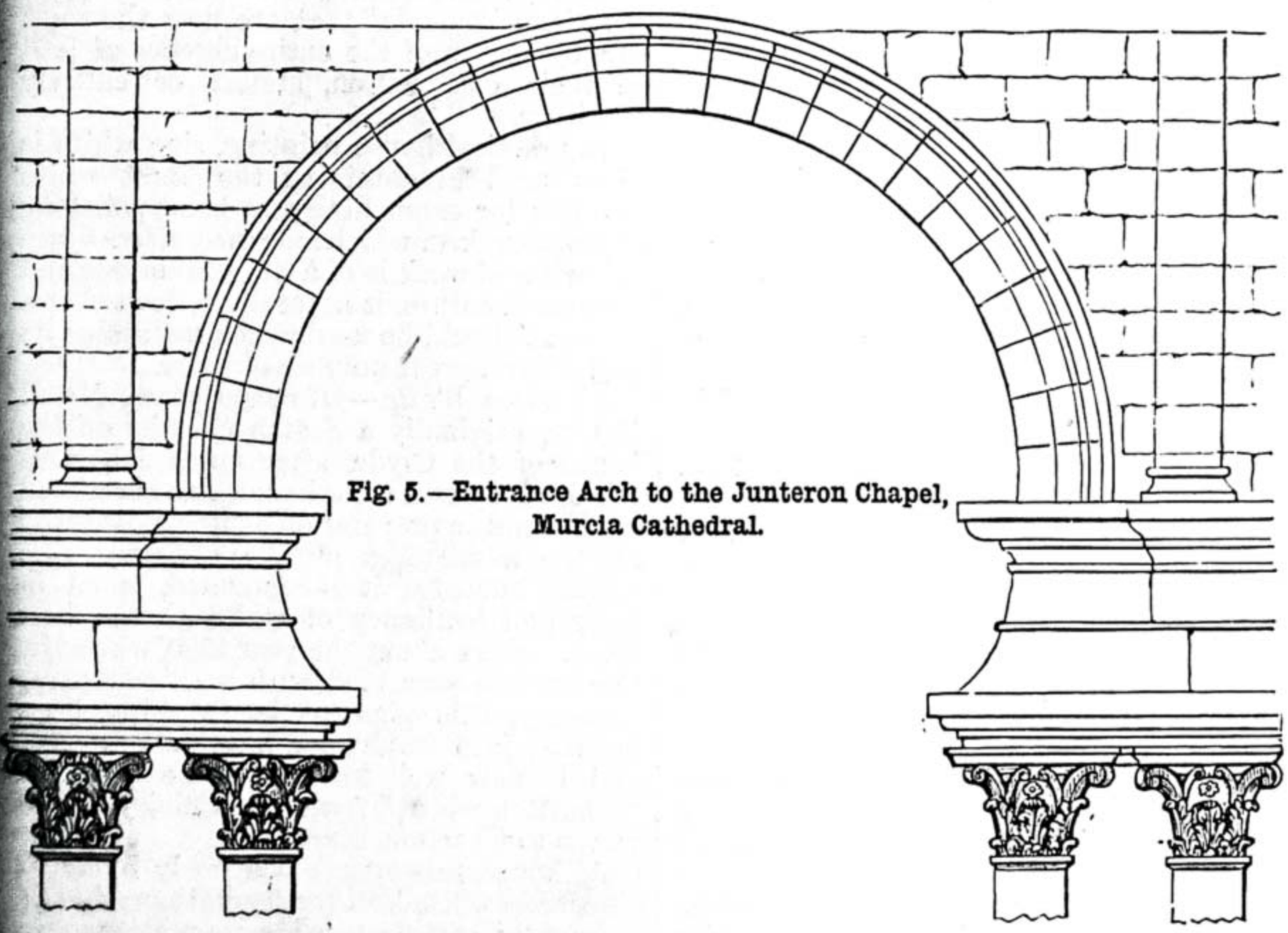

Fig. 5.—Entrance Arch to the Junteron Chapel, Murcia Cathedral.

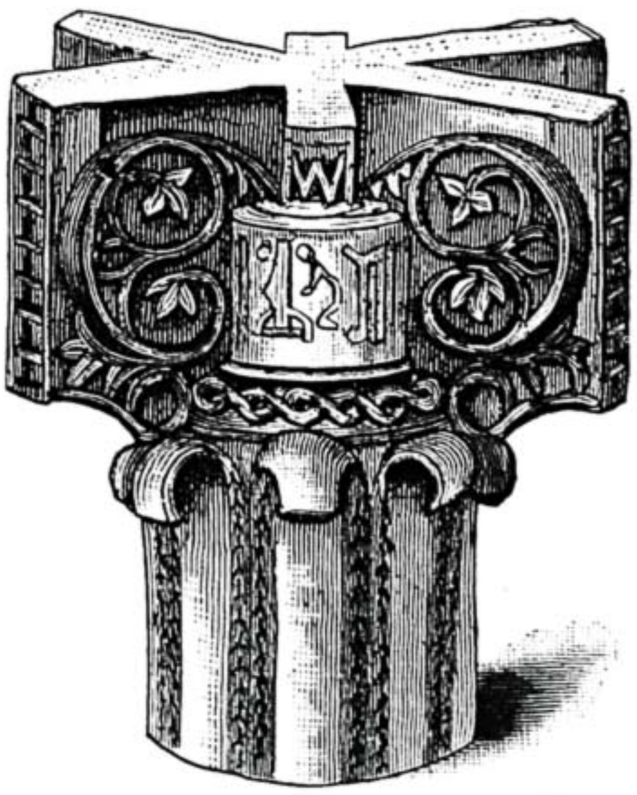

Fig. 4.—Moorish Capital: Murcian Type.

SOME CURIOUS PIECES OF BUILDING CONSTRUCTION.

BY C. C. C.

THE very remarkable arch shown in the accompanying illustration, Fig. 1, may be seen over the doorway of an old house in the street of the Madre de Dios, in the Spanish city of Murcia—a city which, from the fact of its having been the capital of a Moorish kingdom through seven successive reigns, proudly styles itself, "The Seven-times Crowned Murcia."

In this city there may still be found some few remains of Moorish architecture, and the arch before us is commonly spoken of by the Murcianos as one of them. This is an error, for it is undoubtedly a work of the seventeenth century, constructed to suit the whim of some eccentric hidalgo. Standing alone as a single arch, it is certainly more curious than beautiful; yet it might, perhaps, if placed in apposition with another similar

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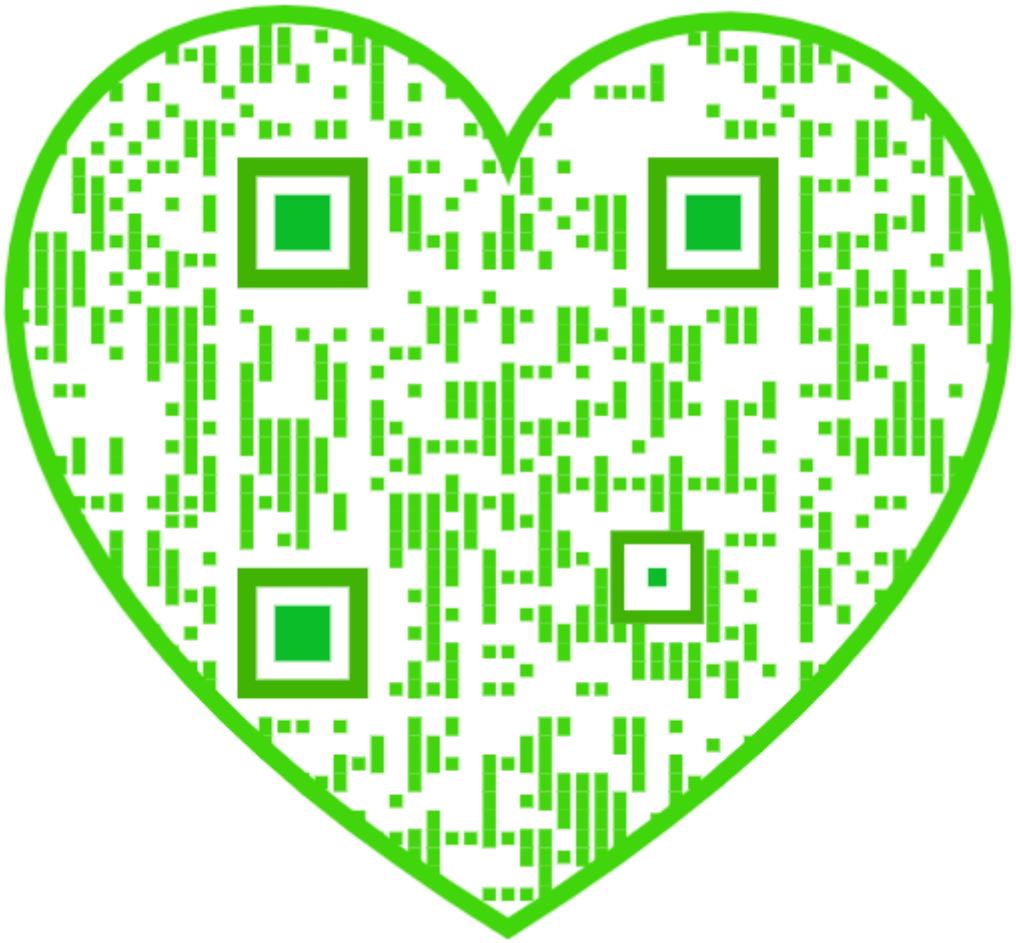

arch, the stones of which curved in a contrary direction, produce by the combination something more pleasing to the eye, though still impressive from its strangeness. Advantage might also be taken of the curved form of the stones to connect the two arches by a circular dripstone moulding, or an ornamental extension of the keystone might probably be made with good effect. It is laid before those interested in building matters as a text upon which to exercise their ingenuity.

Though this queer arch is certainly not Moorish, the house in front of which it figures, and which towards the public street shows early seventeenth century work only, is undoubtedly Moorish in its origin. On entering and passing on into the *patis*, or small open court, the visitor will come upon some remains of genuine Moorish arches, and these, too, are so far removed from the commonplace as to be worth the attention of those who have an interest in building. Their construction is, as construction, superior to those ordinarily met with; the springstones, which are of dark marble, being of a size sufficient to reach not merely to the nominal but to the actual spring of the arch. Fig. 2, in which a portion of one of these arches is shown, will explain our meaning. The ordinary construction of the Moorish horse-shoe arch is illustrated in Fig. 3 (from a sketch taken by the writer in the Alhambra). In this the springstone, *a*, is of white marble, but above it, to the actual springing of the arch, it will be seen that the work is carried on in horizontal brickwork, the thin bricks rather resembling quarries in their general proportions than what we should call bricks. It must be obvious that such construction will be far inferior in strength to that of the horse-shoe arch in the Murcian house of which we are speaking. The strange mixture, seen in Fig. 3, of costly with common materials, of marble and mere brickwork, is by no means unusual in Moorish building.

Although Murcia is set down in "Murray's Handbook" as a city worthy of only a single day's visit, it has been found by the writer to be singularly rich, as regards its architecture, in examples of workmanship so far removed from ordinary types as to be full of interest and suggestiveness. Fig. 4 illustrates a Mooro-Murcian style of capital different in form (so far as the writer is aware) from anything to be met with elsewhere. Its upper part consists of six arms, four long and two shorter ones, and all richly decorated with carving. Unfortunately it is not in the writer's power to say what form the abacus assumed, as he was unable to meet with any complete capital. The material of the example sketched was white marble, but there is much about the form which suggests its adaptability to wood. Possibly the English wood carver or cabinet maker may be able to derive some useful hints from it.

That he may pick up a wrinkle from Murcian work of a different school, the reader is referred to Fig. 5, which shows the entrance archway to the Junteron Chapel, Murcia Cathedral. This arch is interesting as showing how its architect, building in the pseudo-classical Italian style of his period, contrived so to handle it as to produce an effect approaching that of the Moorish horse-shoe arch of the country.

The story of this chapel is as interesting as its architecture. Its founder, Juan Rodriguez Junteron, was, according to the popular legend of the place, the son of a poor Murcian cobbler, but gifted with a natural aptitude for learning. The contempt with which, in his younger days, he was treated by his fellow-townsmen sank deep into his heart. He made his way to Rome, where his abilities met with more appreciation. He found favour at the Papal Court; became a Cardinal; and eventually returned to Murcia as its Archbishop. In this dignity he had abundant opportunities for paying back with interest the scorn with which the Murcians had treated him in former years, and he neglected none of them. The buildings which he raised, this chapel and his house, the latter a structure consisting of four towers clustered round a central and taller one, are noteworthy as being architectural embodiments of revenge. Cardinal Junteron left them as monuments of his hatred to the Murcian people. It was in words equivalent to "Thou art Junteron!" that he had been taunted when a poor youth, and these words he adopted in his prosperity as his motto. They appear on the front of his house, and wherever they can be introduced among the decorations of his chapel. This chapel he built as his last resting-place, and it is said that all the wrought stones used in it he caused to be carved in Italy, that the Murcian artificers might derive as little benefit from the work as possible. The dome of the chapel is, as regards its carved decorations, as unique as the entrance arch. These decorations consist of dismembered parts of the human body, combined with ornamental details, no complete figure appearing anywhere.

These curiosities of workmanship from a somewhat out-of-the-way corner of Europe are not brought forward as mere curiosities, but as matters which may afford valuable "wrinkles" to those interested in building and decorating, and as showing how, in certain architectural features which we are accustomed to consider as unalterably fixed by custom, the bolder designers of other lands have succeeded in introducing originality and novelty.

PLAIN AND DECORATIVE HOUSE PAINTING.

BY A LONDON DECORATOR.

White, Yellow, and Red Pigments.

Let us now consider the sources, nature, and qualities of the most useful pigments, material colours, oils, varnishes, and other mediums used for house painting.

White Lead.—Of all preparations used in oil painting, white lead—white oxide of lead—is at once the most useful and important. It enters into, and forms the "body" of, most light oil paints, and, by the addition of other material colours, tints and hues of every description may be obtained. For covering power, or opacity, it stands pre-eminent amongst all whites. If it is genuine in quality, and has been properly prepared for use, it is a very reliable agent in obtaining a successfully painted surface, viz., a compact and pleasing incrustation, which, under fair conditions, maintains its colour, and is impervious to moisture for a great number of years.

The ordinary process of obtaining white lead is by the slow corrosion of small castings of metallic lead, caused by its exposure over acid in small earthenware vessels. This is known as the Dutch method. Of recent years, however, a successful American invention has been introduced into this country, by the processes of which the dressed ore is volatilised by heat, the resulting fumes are carried forward by air currents, and ultimately solidified, instead of escaping into the atmosphere. The end of which is that, after necessary refining processes are completed, there remains a fine, sublimed white lead, which has been obtained without the escape of any poisonous fumes, and presented fit for practical use without any particular danger to the health of those engaged in its manufacture.

Flake White, Nottingham White, Silver White, etc., are all preparations of metallic lead, differing in process of manufacture and minor resultant qualities, but are not necessary here to be further considered.

The ordinary white lead for painting is obtained, ground to the form of a thick paste, in linseed oil, the heaviest and whitest being the best. It is, as a commercial article, extensively adulterated with sulphate of baryta, whiting, etc., and it follows, therefore, that the surest way of obtaining it genuine is by purchase from a vendor or firm of reliable reputation, and to be willing to pay a fair price according to the fluctuations of the market.

Zinc White.—Oxide of zinc is a very useful pigment, being permanent in both oil and water. To no extent, however, does it rival, for general use, the oxides of lead, since it is vastly inferior in body—covering power—to genuine white lead. Contrary to the latter, however, it does not discolour and blacken by the action of sulphuretted hydrogen—poisonous air; but its principal merit is found in the fact of its being entirely free from the dangerous attributes, both during preparation and use, which attend the handling of white lead. Although there can be only one opinion of the value of the last-mentioned quality of zinc white, the entire advantage of the former particular is open to being questioned. Probably, few persons outside the trade are aware that by use of white lead paint they have in their houses a sensitive detector of poisonous sewer gas—a sanitary quality of which most of the "sanitary enamels," that are now the rage, are, by reason of the entire absence of lead in their composition, almost or entirely destitute.

In practical house painting, zinc white is often used in obtaining the finest white surfaces for enamelling and hand polishing of woodwork, of which more hereafter. Since this class of work is of a very laborious and expensive nature, it naturally follows that a pigment should be used which maintains its colour for a great number of years.

Charlton White.—Of recent years, Mr. J. B. Orr, originally a Scotch chemist on the banks of the Clyde, after much laborious toil of study and experiment, has succeeded in obtaining a preparation of zinc, possessing all the advantages of the ordinary zinc whites, but also, it is contended, equal in body and brilliancy of white to the best leads. Since about the year 1880, when Mr. Orr became connected with a silicate paint company, this pigment has steadily been growing into favour for interior purposes, and is now well known to the trade as "Charlton white," from the vicinity of the works to Charlton, Kent.

Although this article is scarcely likely to supersede white lead for general purposes, it is rapidly getting a wide reputation. Its elementary sources are, I believe, barytes, strontium, and zinc; its market value is about the same as the best white lead. It may here be in place to mention that, mainly by the instrumentality of a notable and successful French house decorator and economist—the late Ed. Jean Leclaire, of "Maison

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Leclaire" fame—a preparation of zinc is the principal white pigment used by the painting trade of Paris.

Having thus made familiar to the reader the pigments of white, we will turn our attention to what are generally termed "colours," but more correctly, coloured pigments, or material colours, treating herein only of the most common and useful, and leaving what are termed "fine colours" for consideration in the more advanced portions of our subject.

Yellow, as a colour, having the most affinity to the neutral white, and its pigments being much used for admixture therewith, we will enumerate, firstly, the most serviceable of its pigments:

Yellow Ochres.—For all purposes of house painting, the yellow ochres are the most useful. These pigments are found in a native state in most countries, and plentifully in our own. In colour they vary from a bright golden, but not "lemon," colour of "yellow ochre" to the dull or "sad" brownish-yellow of "spruce ochre." From the earliest days of history, they have been known and used, being of good body, and very reliable, if suitably prepared, for both oil and water painting. The variety of tone and shade in which they are to be found is endless, and to the action of iron is due the colour of them all. As all varieties of ochre, Oxford—a more reddish hue—stone and spruce can be produced artificially and cheaply from iron, and since all native pigments require grinding and washing before being fit for painting, it need scarcely be added that the bulk of such yellow pigments used are of the manufactured kind. For making with white the very serviceable "straw," stone, and buff tints for large, plain surfaces, and the "grounds" for graining, as will be shown in another part of my subject, the ochres are quite indispensable.

Terra di Sienna, or Raw Sienna, is another native yellow, also of an iron nature, and a very useful pigment. Although not so clean and bright in yellow as good ochre, it has more staining power when used with white, with which it forms very soft and agreeable cream tints, and the so-called "ivory whites," so much in demand of late years. It is obtainable ready ground both in oil and water, is equally serviceable in either case, and is reasonable in price. For the imitation of maple, satinwood, pitch pine, etc., it is very popular and useful, prepared in water, whilst its semi-transparent nature renders it valuable where transparent effects are desired in oil painting processes.

Burnt Sienna.—Although coming more under the heading of red pigments, by reason of its bright, if impure, orange red, this is, as its name implies, a burnt preparation of the mother pigment. By the latter process, it gains also in transparency and staining power, and it is equally indispensable when graining some kinds of wood.

Chrome.—This pigment is generally known in three varieties of colour, appropriately enough as "lemon," the palest; "orange," the strongest and reddest; and "middle chrome," the latter a rich golden colour. Notwithstanding so many house painters like to handle chrome, its brightness and purity appearing to have some sort of fascination for them, it is anything but a desirable pigment for house painting. Being chiefly derived from lead, they have a good solid body and appearance, and make with white very bright tints. They do not, however, maintain their purity of colour for very long, and where they have been used a perceptible darkening is soon noticeable, whether in oil or water; neither are they good pigments to use in admixtures or "compositions" of colours. Of this more anon.

Red pigments of a permanent nature are both necessary and forthcoming for our use, and range from the most vivid tones down to the subdued shades of reddish brown.

Vermilion is pre-eminent for its brilliancy and purity of red, and is one of the pigments known and used by the ancients. Although it may be found in a native state, principally in China, requiring grinding, however, before being fit for use, the vermilion of commerce is principally an article manufactured from mercurial sources. It is seldom in much requisition for house painting in its full strength, being too vivid for the light, climate, and social sentiments of this country; and being also very heavy, and ranging from 3s.6d. to 5s. 6d. per pound retail, it is too costly for large surfaces. Vermilion is, however, very useful for obtaining, with white, pure and clean pink, and similar delicate tints, which are permanent; if required in its full brilliancy, vermilion stands best mixed with, and applied in, good oil varnish alone.

The most invaluable, and also the cheapest, red pigments are the class known generally as red ochres, the best for house-painting purposes being Venetian and Indian reds and purple brown.

Venetian Red, or scarlet ochre, is a fairly bright pigment of a "brick-red" colour. It is thoroughly permanent, of good body, makes clean tints with white in both oil and water, and is sufficiently cheap for any purpose.

Indian Red, originally coming from Bengal, is a rich, deep red, of slightly purple tone, with all the good qualities of body and permanence of its preceding pigment. Of late years the supply of that brilliant and rosy-toned pigment which we originally knew as Indian red appears to have been exhausted, its place now being taken, or rather its name usurped, by the comparatively dull and muddy reds of artificial source.

Purple Brown, as its name implies, is the lowest in the scale of brightness, being, in fact, a dense brown. It is most in demand for external painting, when it forms the basis of most so-called "chocolate colours." Although not being useful for admixture with white—muddiness resulting—it presents in mass a comfortable-looking appearance used alone, in oil or water processes.

All these reds having sufficient covering power to hide in one coat, if properly mixed and used, almost any other coloured surface, are, therefore, very useful and economical for preservative and plain painting in such a climate as our own. Although existing in a native condition, these commercial reds are usually manufactured pigments, viz., burnt ochres, and the colour is due to the presence of iron. They are all sold in powder form, but Venetian red and purple brown are generally to be had ready ground in linseed oil. Vermilion and Indian red, from the reason of their more heavy nature, would soon become solidly caked, and, therefore, are only ground in oil or turpentine when so ordered. Of course, I do not here allude to colours in collapsible tubes.

Red Lead is a preparation of burnt massicot, of a bright scarlet colour, and although, if used by itself in oil or varnish, it will retain its brightness for some, it is useless for mixing tints. Being a good dryer—a subject we will shortly touch upon—it is used for hardening white lead, when mixed as a putty or as paint for preservative purposes.

HOW TO MAKE A PIANO.

BY "NIL DESPERANDUM."

INTRODUCTION—TENSION OF PIANO—STRENGTH OF BACK—MATERIAL REQUIRED—HOW THE BACK IS MADE.

THERE are no doubt many readers of this Magazine who not only desire the possession of a piano, but who would wish to construct one for themselves. It is with this twofold object that I write this series of papers. I shall not aim so much at literary precision as a desire to be explicit, and so simplify everything, with words and sketches, that the amateur will readily understand. To those who do not wish to make a piano, but who possess one already, I hope they will be interested in the perusal of these papers, as they will know how their own piano was made. The reader will see that I have adopted for my *nom de plume* "Never Despair," and I hope the amateur, if he starts making a piano, will adopt it for his motto. I remember about twenty years ago seeing the play of *Richelieu*. When the Cardinal asks his page to deliver an important despatch, the page asks, "What if I fail?" Richelieu exclaims, "Fail, boy, fail! In the bright lexicon of youth which fate has destined to a glorious manhood, there is no such word as fail;" so I hope the reader will omit the word fail from his dictionary.

I can imagine the reader saying, "To make pianos you must have a factory and appliances." To make pianos as a commercial commodity, certainly, but I do not want our reader to rent a factory, or to have special appliances, but that he shall use a spare room, or ordinary workshop, having a bench, a pair of trestles, and ordinary carpenter's tools, such as a saw or two, planes and chisels, brace and bits, and some of the minor tools, such as rule, squares, etc. Of course, in a factory, the facilities are greater, for they are needed, to turn out the quantity of work required, manufacturers making from one to forty pianos a week, according to the size of their premises; but it may interest the reader to know that several of our manufacturers have started in a humble way, not occupying more than one apartment for a workshop. In this series of papers I shall take the reader by short and easy stages, so that he can follow me, and, if he does so, I hope that he will be rewarded by possessing a piano of his own make.

Having said so much by way of introduction, I would impress on my readers that if a thing is worth doing, it is worth doing well; and in making joints, or gluing any part of the work together, see that everything fits, so that when you have put it together you shall be satisfied with it.

The strain, or tension, on a piano is very great, according to the size, or how it is strung. The tension from top to bottom of a cottage piano is about seven to eight tons, while a grand piano has a tension of about sixteen tons. So that the reader will see that the back of the piano, or foundation, must of necessity be strong to bear this great strain. If the back is not strong enough, then the piano would never stand in tune, for the two extremities would be gradually drawing together, so the strings would slacken accordingly.

The parts of the back are named bracings, linings, wrest plank, and bent side. The back of the piano I propose to make will be composed of nine bracings or uprights, the size of the back 4ft. 2in. wide by 3ft. 6in. high. The bracings are made of spruce, as free from

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knots and as dry as you can get it, 4in. by 3in. It will take about 50 ft. of this. The wrest plank is the upper portion of the back, where the wrest, or tuning-pins, to which the strings are attached, are placed. This is made from beech, 1½in. in thickness, and 8in. wide, and 4ft. 3in. long. Then there is the bent side; this is also made from beech. Pins are also driven into this to attach the other end of the strings. This beech is cut specially for the trade, as it is cut on the quarter, that is, the tree is cut in four parts, and this cut off the faces, so that it is not so liable to split. Wrest planks and bent sides can be purchased from Mr. Burch, timber merchant, Prince of Wales Road, N.W.

I must now speak of the glue, a very important item in piano making. See that you get the best. The best I know of is Cox's Scotch glue. It has the trade mark of "Chanticleer" on each cake. To prepare it, break it in pieces, and cover it with cold water, leaving it to soak all night; then put a portion in your glue-pot with the water, and boil thoroughly, stirring from the bottom occasionally.

To use a nautical phrase, having cleared the decks for action, we will commence making the back. Cut nine lengths of bracing 3ft. 6in. long, also two lengths 4ft. 3in. Now start planing one side of each, straight and out of winding; take a straightedge, put it on the work from corner to corner, and if it is hollow, plane off those two corners until you get it straight, that is what is meant by taking it out of winding, or twist; when you have got the 4in. side straight, you square the edge or 3in. side of each, and make a mark, so that you will know them; now take the rough off the other sides, and stand them by to dry, as they dry quicker when planed over. Now prepare the wrest plank and bent side by planing over, so that they will lay level and square across. You now require a couple of sheets of sycamore veneer. You cut it the width of your wrest plank until you have sufficient to cover its entire length, then joint it edge to edge on a board by tacking it temporarily, then glue strips of paper over to keep it

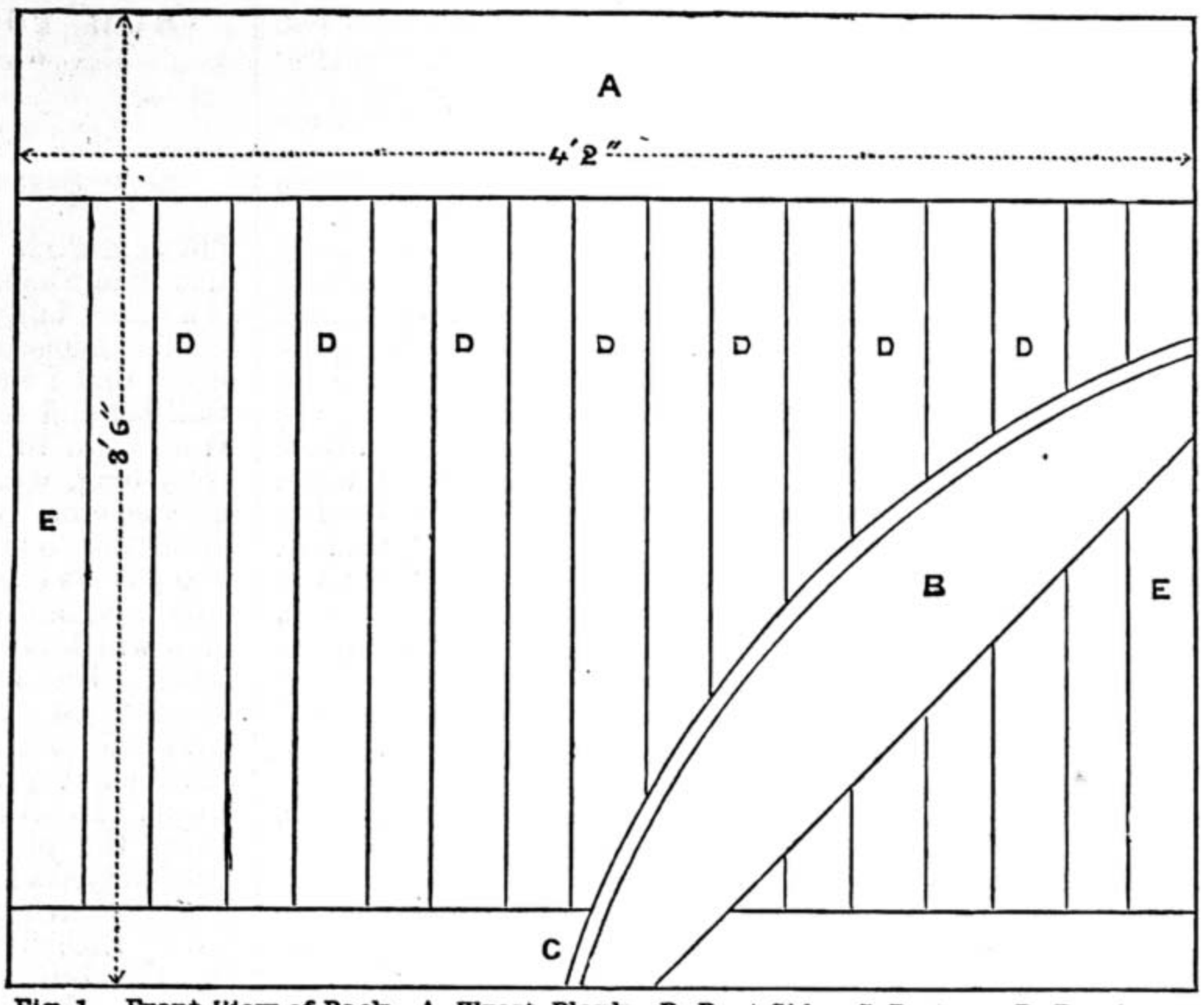

Fig. 1.—Front View of Back—A, Wrest Plank. B, Bent Side. C, Bottom. D, Bracings. E, E, Linings. (Scale, 1 inch to 1 foot.)

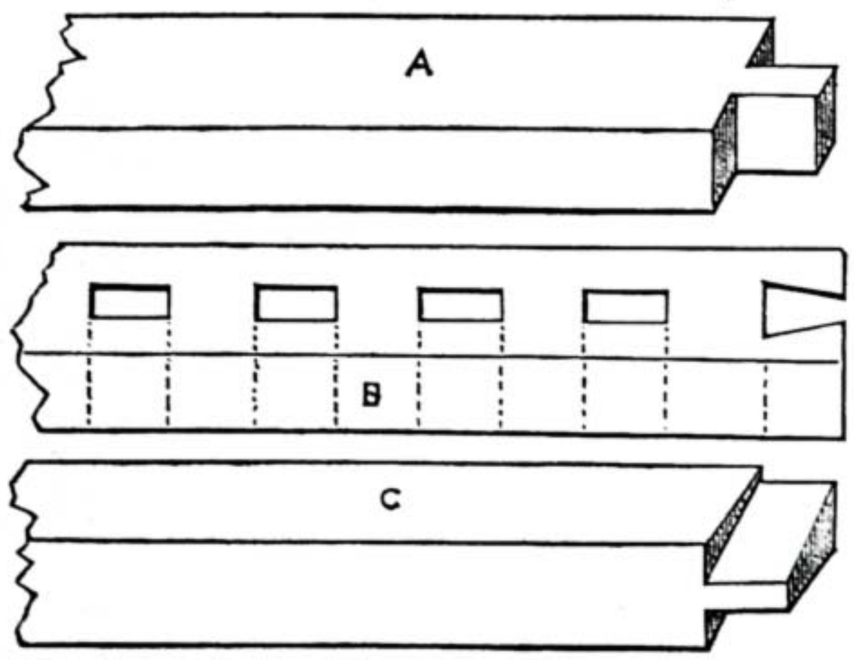

Fig. 4.—A, Bracing with Tenon. B, Plan of Bottom; same for Top. C, Lining with Dovetail.

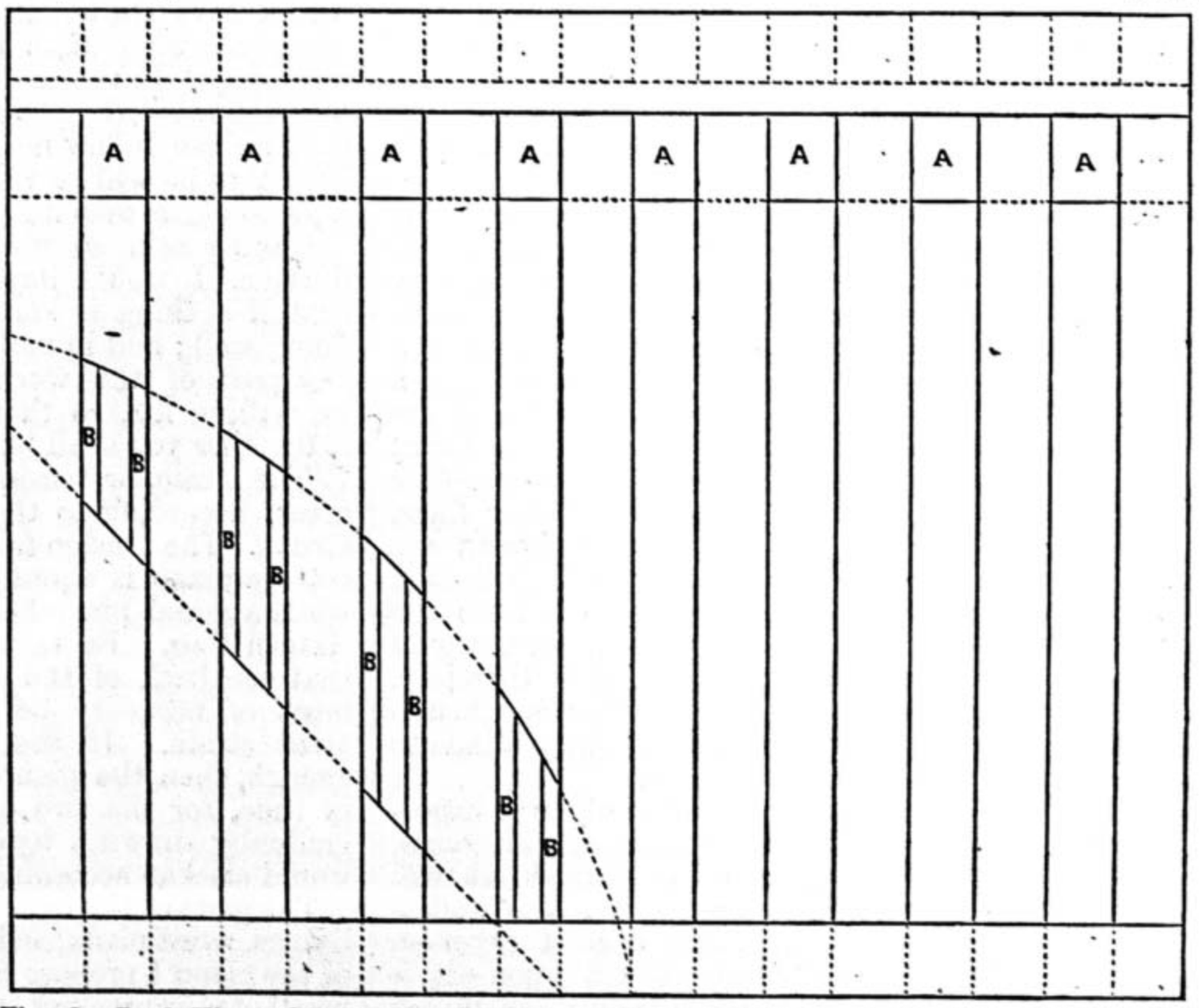

Fig. 2.—Back View of Back—A, Blocks behind Wrest Plank. B, Blocks behind Bent Sides. (Scale, 1 inch to 1 foot.)

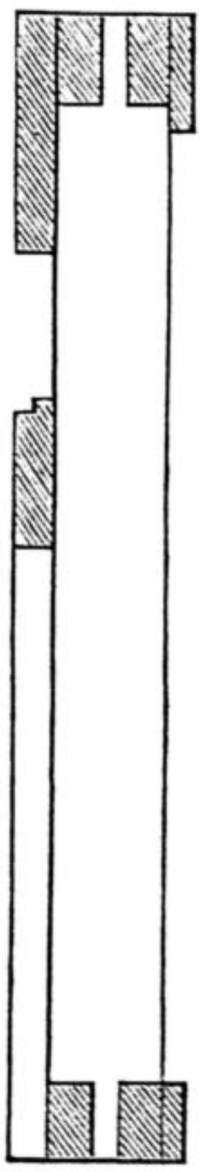

Fig 3.—End Section, Treble, showing how Back is put together.

together. When this is dry, tooth or scratch it with the edge of a saw. Now you want a board made hot, and glue your wrest plank, also the side of your veneer that is not papered, and place your hot board on, after being rubbed with soap, to prevent sticking, and press with hand-screws. After leaving this an hour or two, take your hand-screws and board off, and plane over with a smoothing plane set fine, and scratch the surface of the veneer. Now take the sheet of veneer the length and width of wrest plank, and glue as before.

Now the reader can make the frame of his back. It is to be 4ft. 2in. by 3ft. 6in. finished. The two lengths of bracing you cut 4ft. 3in.; they are for the top and bottom of your frame, so that their exact length will be 4ft. 2in. I gave you ½in. at each end to work with, for cutting square, etc. Now your outside bracings are called linings; these are dovetailed into the top and bottom, and the bracings tenoned into the top and bottom. You must divide the spaces apart for the bracings about equal; if anything, a little closer together in the centre, as the strain is greatest at this part. If you take the thickness of the bottom and top off the height of the piano, this will give you the measurement between the tenons; for instance, say your bottom and top were 2½in. thick, that would make 5in.; take that from 3ft. 6in., that would give you 3ft. 1in. between the tenons. The mortises you can bore out with a 1in. centrebit, leaving your tenons 1in. to fit. In putting the back together, before gluing see that it all fits together nicely and square; this try by placing a rod from corner to corner; they ought to be the same distance as each other; if not quite, a good push at one corner will make it right. Attend to this also when gluing together. When ready to glue together, get some friend to assist you. Just place the ends of the tenons in their respective places, just so that it holds together, then warm both ends well, and glue with a brush as quickly as possible the parts of the tenons that are visible.

Now knock together with a heavy hammer, and see that it is square,

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and lays flat on the floor, and leave it to dry. When the glue is dry, plane over both sides clean. Make a pencil-line 8 inches from the top, and fill up the interstices to this line with blocks 6in. long; this is to make a good bed for your wrest plank to be glued on. When these are dry and levelled, tooth it well, make it warm, also warm the wrest plank. After it has been fitted knock two nails at each end of your line, and glue and put on hand-screws. The reason one veneer crosses the plank, and the front one is put on straight, is to prevent the plank splitting. Now you gauge a line ¾ of an inch from the bottom of your bent side, on the round edge, and ⅜in. on the top; then put in your bench screw, and saw with your hand saw down the line on your edge; then chop out with your chisel from the line on the top; this will form a rabbet for the sound-board to lay in. When the back is facing you, with the plank at the top, the treble will be to your right hand. On your treble lining under the wrest plank mark 5½ inches. From your bottom corner at the bass end mark 2ft. Knock two nails in temporarily, and lay your bent side on and mark round with pencil, then fill up the interstices with short pieces of bracing, as you did for the plank. When dry, level and tooth, and glue your bent side up to the nails. After this is dry, get out two pieces of spruce 3in. wide, ¾in. thick, and 4ft. 3in. long. After planing, glue one top and bottom at the back of your back. Your back is now complete. In my next paper I shall deal with the construction of the sound-board.

PRACTICAL VENEERING.

HAMMER-LAID AND CAUL-LAID VENEERS.

BY DAVID ADAMSON.

THE first thing that will probably cause the young veneerer to pause will be a doubt on learning that there are two kinds of veneers, or rather, that they are prepared in two different ways, which of them is the best, or as price will probably show him this, whether for practical purposes one is better than the other. He will soon find out that broadly, without referring to kinds of wood specially; veneers are to be obtained either "knife-cut" or sawn. This indicates the way in which they are prepared, the one being sliced or cut with a knife, the other with a saw, as their names imply. So far as I am aware, knife-cut is seldom, if ever, used for good work, partly no doubt owing to its extreme thinness, but, perhaps, principally because the best wood is always sawn. It is rarely that one sees much figure in knife-cut veneer, and I certainly cannot recommend its general adoption. The extra cost of saw-cut veneer is so slight that it is hardly worth while using the inferior kind. Perhaps here I may as well say something about the cost of veneers generally. These are in the ordinary kinds, that is those from logs, usually sold by the foot super. like ordinary timber, but burrs, which by the way are knife-cut, and such like are reckoned at so much each, the price depending not only on size, but marking, probable amount of waste, and various other considerations which need hardly be gone into here. Occasionally, however, whatever their kind, veneers may be quoted for by the foot, which, of course, always means superficial. Prices vary enormously, not only for different kinds of wood, but for different qualities of the same wood, and it may be taken as a fixed rule that the really choicest veneers of any description are more valuable than even ordinary good sorts in the solid, say, of 1 in. thick. Naturally, some sorts do not vary so much as others, and fashion as well as supply has a good deal to do with prices. These matters, however, are for the purchaser to settle with the veneer merchant, and beyond the mere mention of them they hardly come within the scope of this paper.

Fig. 1.—Hammer generally used by Cabinet Makers in Veneering. A Home-made Tool.

The terms "hammer-laid" and "caul-laid" veneers have already been alluded to, and it will be necessary to explain them in order that the learner may have a proper comprehension of the work implied by them.

In the former class of operation, the veneer is laid by pressure with a hammer specially made for the purpose. Perhaps the name hammer may be rather misleading to novices, as according to the ordinarily accepted purpose of this tool it might be inferred that the veneer is laid by knocking. This, however, is not the case, as the veneering hammer is used as a squeegee with constant equable pressure instead of a series of impacts or blows. From this it will readily be understood that a hammer in the ordinary sense of the word is rather a misnomer, and but for the "veneering hammer" being so well known in workshops, it might be more appropriately referred to as an iron squeegee. The face or striking part of an ordinary hammer head is, therefore, of little or no consequence in a veneering hammer, the opposite end of the head or pane being the all important part. This, accordingly, is widened out very considerably in order to cover as wide a surface as is compatible with convenience. It is hardly worth while to buy such a hammer, as it can very easily be made by the worker himself. A strip of iron of, say, from 3 in. to 6 in. long and of any convenient width is firmly fixed between two pieces of wood, or in a groove cut in one piece to form the head. In this a handle is inserted. The precise shape and size of any part are quite immaterial, the principal points to be observed being strength and convenience. The iron edge of course must project beyond the wood, and it must be straight with a smooth

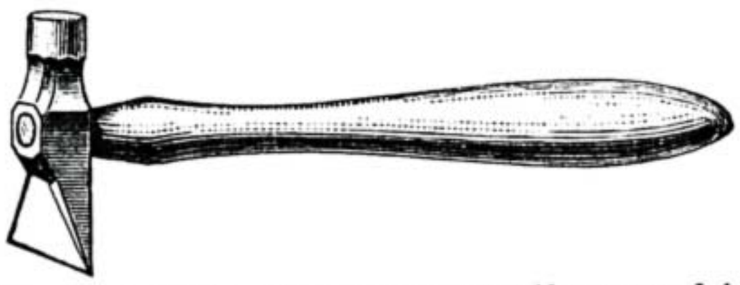

Fig. 2.—A Form of Hammer sometimes used in Veneering.

rounded edge in order to allow it to be passed freely over the veneer. To prevent this being injured, it is also well to slightly round off the lower corners. Fig. 1 is an illustration of a veneering hammer of this kind, and I think it will be sufficient guide to those who wish to make their own. Perhaps I ought to say that the metal should be thick enough not to bend when the hammer is used, and that the smoother the edge is the more easily the tool can be used. Fig. 2 is a form of hammer that may be used, but I have never seen such a tool in the hands of a cabinet maker when veneering.

In the other kind of veneering, viz., that with a caul, the hammer is not used, its place being taken by a uniform equal pressure over the whole surface of the veneer, which is kept in close contact with the foundation on which it is laid till the glue has set. The caul itself is either wood or metal, either of which must be shaped exactly to fit the surface to be veneered. Thus for a flat panel it must be flat, while for a concave surface it must be convex, and so on. The object of the caul is to squeeze out any superfluous glue, for I presume it will be almost unnecessary to remind any one who contemplates doing veneering that too much glue is as bad as too little. Therefore, unless the caul accurately fits to any shaped or moulded surface it is defective. Where large quantities of the same size and shape are required, the necessity of having a caul to fit is not much trouble, but those who have only to veneer a moulded surface now and again will find it scarcely worth while to prepare a specially shaped caul for each, and for such work a substitute will be mentioned later. To do so at present might only confuse the beginner, who should be well acquainted with the way to use a plain flat caul before attempting anything of a more complicated character. As has been said, the caul may be either of wood or metal, but for general purposes a combination of the two may be advocated. Wood

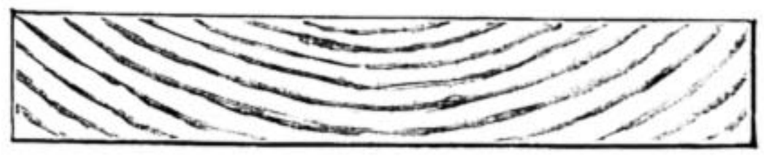

Fig. 3.—Section of Board showing Heart Side uppermost.

alone, unless carefully used, is apt to get burnt while being heated, as will be explained in due course. Iron again is for many reasons unsuitable, and, without going into all the reasons, it will suffice to say that zinc is the metal generally employed for hand-cauls. Other kinds, whether steam or gas, being more of the nature of machines, and only likely to be used where much veneering is done, may very well be left out of consideration in the present directions, which will, however, enable any one who wishes, and has access to a gas or steam caul, to use it intelligently. The actual process of veneering is the same, the difference being in the preparation and management of the caul. For cauls for occasional use wood alone will do very well. I mean by this that the result will be as good as if zinc were used, and the amateur, at any rate, will seldom wish to do so much veneering as to make it worth his while to incur the expense of metal. On the whole, perhaps there is less risk of spoiling work by using wooden cauls alone, provided they are not burnt, than there is with metal, but with a little caution injury should not happen whichever is used. With metal the danger lies in overheating it so that the glue between the veneer and the foundation is not merely softened but gets burnt, and the same thing may happen to the veneer itself. With a wooden caul, of course, such a mishap is much less likely to occur, as the caul itself will probably burn before it is too hot to damage either the glue or the veneer. Of course, I am not wishing to say that a wooden caul cannot be overheated, for it is quite possible to do so, and whether with wood or metal care, to say the least, is highly desirable. To sum up, zinc is

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desirable because it lasts longer than a plain wooden caul, though otherwise wood is, on the whole, as serviceable for occasional use, though its liability to get out of shape or twist is sometimes objectionable. In thickness the zinc employed may be almost anything over that, say, of a penny. If it is too thin it does not retain sufficient heat, while excessive thickness simply means waste of money. Perhaps as a general thing the zinc is usually preferred of from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. in thickness, the former being quite sufficient for ordinary purposes. Less might do, but I cannot state that it would from personal knowledge. One well-known authority recommends $\frac{1}{4}$ in. as the best thickness. I do not pretend to say which is best, as I think more depends on the way the work is gone about than on the thickness of the zinc, but I may state that in one shop with which I am acquainted, where some of the soundest furniture procurable is made, there is no caul (zinc) over $\frac{3}{16}$ in. thick. Even with a zinc caul a backing of wood is necessary to keep it flat down to the work, and to prevent the heat from dispersing too rapidly. This wood may be of about 1 in. thick, which is sufficient generally, though there is no reason why it should not be of any greater dimensions, beyond the fact that any excess, being unnecessary, means waste. A good deal, of course, depends on the way the caul is clamped down and on its size. For the material nothing is more suitable than good sound pine.

Such a piece of wood used alone—without zinc—is a plain wooden caul, so that there is nothing very elaborate in the special preparations required to lay veneers with. Perhaps before leaving this part of the subject, it may be as well to state that wooden cauls are more old-fashioned than zinc, and that in well-appointed workshops they are now generally discarded.

In addition to these things a toothing plane is also desirable to roughen the surface to be glued, but this can hardly be regarded as a tool required only for veneering purposes any more than the hand-screws which are used to hold the cauls down with. Something may now be said about the comparative merits of hammer and caul-laying, though it is quite conceivable that some may altogether object to the word merit in connection with hammer-laid work, and deny that there is any merit in it. On the other hand, some workers will also be found to assert that it is "good enough," and no doubt it is so for some purposes or for very small work. The general concensus of opinion, however, among those who have devoted sufficient attention to the subject is that caul-veneering is out and away the better method, especially when anything but a mere strip of veneer has to be laid. Even then the pressure maintained till the glue has set renders it preferable. When laid with the hammer there are more likely to be blisters than when cauls are used, and besides this there is less shrinking with the latter. For "slop" work the hammer has everything in its favour; the caul for such is not to be compared with it. For ordinary thin knife-cut veneers the hammer does very well, especially if the veneers are of a light-coloured wood. Indeed, some go the length of saying that all light-coloured veneers are best laid with hammer, the reason being that the glue is not so likely to discolour them as when laid in a caul. With care, however, in the selection and use of the glue, there is no reason why the lightest veneer should be stained. With regard to this I suppose it will be understood that the heat of the caul causes the veneer to absorb some of the glue, and this if of dark colour naturally destroys the purity of a light-coloured veneer, though it is not observable in the darker kinds, such as mahogany and walnut. All things considered, it may be said that veneers should be laid with a caul, and that the hammer should only be had recourse to as a substitute, or when experience shows that it can be used without detriment. It must not be forgotten that a practised worker may often violate general principles of construction with good results, while a less skilful man would only court failure by venturing to do so.

Let therefore the *modus operandi* with a caul be considered first, reserving any slight differences when a hammer is used for subsequent mention.

First of all, the wood to be veneered on must be properly prepared by smoothing it down as carefully as if it were to be left uncovered. All saw marks must be removed, and if it is pine, take care to select a piece as free from knots as possible. The surface should be gone over with a toothing plane, though this is not always considered necessary. In addition to planing and cleaning up generally, further preparation is required whenever a panel or anything wider than a mere strip, such as part of a door frame, is being veneered, in order that the board when dry may be flat. The action of the water contained in the glue must be taken into account, and counteracted, otherwise the glue and veneer in drying will pull the wood out of shape. Care must further be taken to veneer on the right side of the wood, for if not, the board or panel will have a tendency to become concave or hollow. This is by no means desirable, and when seen at once shows something wrong. Where absolute flatness cannot be obtained, and it often cannot be, it is better for the panel to be convex or rounded outwards, as the appearance is far better than the reverse way. From this those who are acquainted with wood working will see that when at all practicable the "heart side" of a board should be veneered on, as other circumstances being equal, this is the one which becomes convex. To some novices the fact that there is any difference between the two sides of a board may be a new idea, in which case the term "heart side" will not convey any meaning probably. Well, for them let it be said that though the term is a technical one its meaning must be taken literally.

The "heart side" simply means that it is the side of the wood which was nearest the heart or centre of the log. It can easily be determined by looking at the end grain, and noticing which way the segments of the annular rings turn. These, of course, are more or less regular, but there is seldom any difficulty in discerning them on taking a shaving off one end of a plank with a plane. As it is a matter of considerable importance, not only in veneered work but also in other constructions, that the difference between "heart side" and the other should be known, the diagram, Fig. 3, is given in order that there may be no misapprehension. From what has been said there will be no difficulty in recognising that the upper part of the section there represented is the "heart side." This is the one which should almost invariably be selected for the outer surface not only for veneered but for plain work. Sometimes it may make very little difference which side is veneered on, but no instance occurs to me when it would be wrong to do so on the "heart side," though it would be very easy to state instances to the contrary. It may, therefore, be said that the novice will do well not to veneer except on the "heart side" till he has sufficient experience to enable him to decide when he may do so on the other without detriment. Even then, unless he has some good reason for veneering on the other side, he will do well to be cautious in disregarding the rule to lay veneer on the "heart side." If he attends to this he will never be vexed by having his panels turn hollow, due attention naturally being given to other details of the work, for it must not be imagined that care on one point will make up for negligence in others. Perhaps for the sake of simplicity it will, instead of generalising, be well to imagine some particular piece of work as being required to be veneered. Let us suppose it to be a drawer front, for this is not only a very usual piece of work, but the wood is generally of a convenient size to be easily handled, so that it offers fewer difficulties than others might do. What the wood, both foundation and the veneer, is does not much matter, but we will assume the former to be pine and the latter mahogany or plain walnut—not burr, which, requiring a somewhat different treatment, will be dealt with later on. Mahogany, however, may be taken as a typical veneer requiring no exceptional preparation, and presenting no great difficulty in laying it. In fact, it may almost be regarded as the easiest to work.

The ground wood or foundation being ready, the next thing is to cut the veneer to the size required. This should be a little greater than that of the wood to be covered—not much, but just enough to let it project over the edges a little to allow of its being trimmed off neatly afterwards. I am presuming that the veneer is saw-cut and of the usual thickness, which may be roughly stated as being from 10 to 14 to the inch. If the veneer is very rough, that is to say, if the marks of the saw used in cutting it, or any other inequalities, are very decided they must be removed. The toothing plane will do this, but it is unlikely that any great amount of smoothing will be necessary, as most modern veneers are so well cut that they require very little preparation in this way, presenting a marked improvement upon those of comparatively few years ago, which were frequently what we should now call very badly cut. However, we may take it for granted that the veneer is smooth either direct from the saw, or has been made so subsequently. The side to be glued down must be gone over with the toothing plane finely set to roughen it slightly, and afford a firm hold for the glue. Doing this with a thin substance like veneer requires delicate and careful manipulation. Unless quite dry the veneer should be made so by laying between hot cauls previous to using it, but this precaution is not so important with mahogany as with some other kinds. With some it is absolutely necessary, and even with mahogany it may often be of advantage, so that as a general rule the novice will do well to adopt it. With practice he will be able to do without it sometimes. Nothing has been said about the way the grain in the veneer should run, as I presume this will be understood. In case it is not, let it be said that in both the foundation and the veneer the grain should be coincident. Sometimes they are used transversely or at right angles to each other,

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but not in such a piece of work as we are considering. When it does occur, it is so rarely that the exception may be said to prove the rule. Now, having said all that needs to be at present about the veneer, let attention be directed to the wood to which the veneer is to be glued. As has been stated, the action of the gluing must be taken into account, but without concerning ourselves with theory it will be enough to lay down the principle that the wood must be damped on the back. I have heard of the wood being soaked for a day or two previously to use, but I believe this plan is now altogether obsolete, as it is unnecessarily cumbersome and open to many objections. Still it shows that much variation in practice may exist, and that it is more a matter of how the work is done than what course is adopted. There is perhaps no detail connected with veneering on which experts differ so much as on the preparation of the groundwork to which the veneer is to be attached, and one is almost forced to the conclusion that when a man has become thoroughly conversant with any particular method and practises it intelligently, good results are obtainable. This does not, however, prevent one method having advantages over another, and without discussing them all in their various bearings it will suffice to mention one course which is applicable to almost all kinds of work, and one which can hardly fail in being satisfactory. It is this.

Damp the back of the wood to be veneered, say, from half an hour to an hour before using, by rubbing it over with a wet sponge or cloth. The wood will then become slightly rounded on this side. On the amount of moisture and consequent swelling a good deal depends, but it is impossible to give any minute directions, as so much depends on surrounding circumstances. The most that can be done here is to say that the surface of the wood should be fairly wet, and that the water must not be allowed to collect in pools on its surface. It is to be damped, not saturated. Sometimes the plan of placing a layer of damp sawdust on the wood to be veneered and leaving it overnight is adopted, but the slight disadvantage attending this is that the wood may get too much damped while waiting, and that the time required may not be always convenient.

When the wood is sufficiently swollen, it is ready for gluing. The glue, it goes without saying, should be of good quality and properly made. It must be of medium consistency, and, of course, be quite hot. Rub it smoothly on the wood, taking care that the whole surface is covered. No glue is to be rubbed on the veneer, which is simply laid on the glued foundation. Then, without delay, get the caul, which should, in the meantime, have been getting warmed, and put it above the veneer. If the caul be zinc, lay the board already mentioned above it, apply the hand-screws till the glue oozes out at the edges, and let it stand till the glue has set. This will be when the caul has become cold, which will be in the course of an hour or two. With a zinc caul, only the metal is heated, the wood backing being applied cold. The heat for the caul cannot be learnt except from experience, though it may assist novices to say that it must not be so great that it cannot be comfortably handled. *Per contra*, neither must it merely have the chill taken off. The object of the caul, it must be remembered, is to partially melt the glue again after the veneer has been laid on it, at least, that is what the heat does. The pressure on the caul forces the liquid glue, to some extent, into both the foundation and the veneer, air bubbles and excess being at the same time got rid of. All this in theory is very simple. In practice, it is not quite the same thing, and the following hints will be of service.

If the caul is too cold, the glue is not sufficiently melted to flow freely between the two contiguous surfaces of the veneer and foundation. Pressure, therefore, is only partially effectual, the excess of glue and confined air will not be expelled. Blisters and imperfect cohesion will be the result. On the other hand, if the caul be too hot, there is the danger of overmelting the glue, and together with excessive pressure of forcing too much of it out at the edges, as well as into the wood. These directions may seem vague and unsatisfactory, but it will be better to caution the novice about risks to be avoided than to tell him exactly what to do, even if it were possible to supplant his judgment by giving definite rules. Not only is the right degree of heat advisable, but it must be evenly diffused over the whole caul, for it will require only a moment's consideration to show that it would never do to have any parts nearly cold, or others overheated. The pressure also must be regulated, but with small hand-screws there is not much danger of this being excessive. Take care that the jaws of the hand-screws press evenly, and do not let them merely grip the edges, while leaving the caul and the veneer only slightly in contact towards the centre. This may occur if the caul is too thin, or if from any cause it is hollow in the middle. As it is quite possible that some of the glue may be forced through the veneer, a sheet of paper should be laid between it and the caul. This should also be slightly greased, though with mahogany veneer it is not so necessary as with one of a more porous nature, such as burr walnut. The paper will stick to the veneer, or perhaps, I should say, may do so, but it will be of no consequence, as it can easily be cleaned off, and is only mentioned as the dirty appearance might cause the novice, at first, to think that the work had been spoiled. One other little matter I must put the worker on his guard against, viz., the necessity of seeing that the veneer does not slip from its place when laying it in the caul. To prevent this happening, veneer pins are sometimes used, but with care they may very well be dispensed with. Any small nail or tack will do for the purpose, and it will not be necessary to do more than say that in many circumstances their use is objectionable. After all these cautions it seems hardly possible for the merest tyro to go very far wrong in laying a plain mahogany veneer on one side of a panel or drawer front, but the subject of veneering is far from exhausted. After the work has been removed from the caul, it should be placed so that the air does not get to the veneer, say, leaning against a wall, and then left till the glue has become thoroughly hard. If everything has been properly done, the board will then be slightly hollow on the back, and rounded on the veneered or face side. From this it will not alter, or, if it does, it will be to such a trifling extent as to be almost imperceptible. After the glue is thoroughly hard, the surface may be cleaned off by first using the smoothing plane, which it is almost needless to say must be very finely set, then the scraper, and finally glass-paper. Of course, it must be left for the worker to say whether the use of a plane is necessary. If not, by all means do without it, as it is by no means a case of cut and come again with a thin veneer. Although the cleaning must not be done before the glue has become quite hard, there is no occasion to do so as soon as it has. The work may suffer by being cleaned off too soon, but it hardly can by delay in cleaning. It may almost be said that the longer it is left the better; the risk being with premature cleaning that ridges through inequalities of glue may subsequently show themselves, and also that the heat caused by scraping and papering may melt or soften the partially dried glue to such an extent that its hold may be considerably lessened. If this occurs to any great extent, blisters, the *bêtes noires* of the veneerer, may make themselves unpleasantly obtrusive. How these, when they occur, may be recognised and reduced will be stated later on.

TRIPODS AND STANDS FOR CAMERAS.

BY AN OLD HAND.

THE STRAIGHT LEG TRIPOD—THE FOLDING TRIPOD—THE TABLE STAND—THE STUDIO STAND.

NEXT in order of importance to the camera is the tripod or stand, so designated according to its form, the tripod being almost exclusively used for outdoor work, and the stand for indoor or studio work. The tripod consists essentially of three legs, from which it takes its name, supporting a small platform. These legs may be each in one length or made to fold in several joints. In all cases it is imperative that the apparatus should be perfectly firm when set up and free from vibration. These qualities are the most important of any, for with a rickety or vibrating stand no good work need be expected. Whatever form is chosen it must be one that may be depended on as free from these particular drawbacks. It goes without saying that long, light, and slender legs, especially if jointed, are unreliable. The fashion of making everything so light in weight for outdoor work has unfortunately, in many instances, been at the sacrifice of rigidity; and many stands now in the market are not worth the wood they are made of, if good sharp pictures are looked for as a *sine qua non*. Many apparently strong stands will vibrate with the lightest touch, and the tremor continue for some seconds; a gust of wind will have the same effect, and when the time of exposure for the plates is calculated in seconds or fractions of them, the result may be anticipated. Blurred, unsatisfactory pictures are generally all that can be made on such stands, except by the merest chance. It will be as well to bear this in mind in their construction, and never let the idea of extra portability trench in the least on this quality of firmness.

For indoor or studio work, the heavier in reason the stand is the better. The framework is always massive in character in those patterns used especially for portraiture. A kind of stand for studio work of a varied kind is called a table stand, as it somewhat resembles this article of furniture, and for real practical usefulness nothing can be better. All ordinary stands may be classed under one or other of these heads, the difference being merely in pattern or unimportant detail. Almost every maker affects some particular design, and the variety is legion. In the present paper I give working designs for each of these leading patterns, choosing as simple ones as I conveniently can, and I would call

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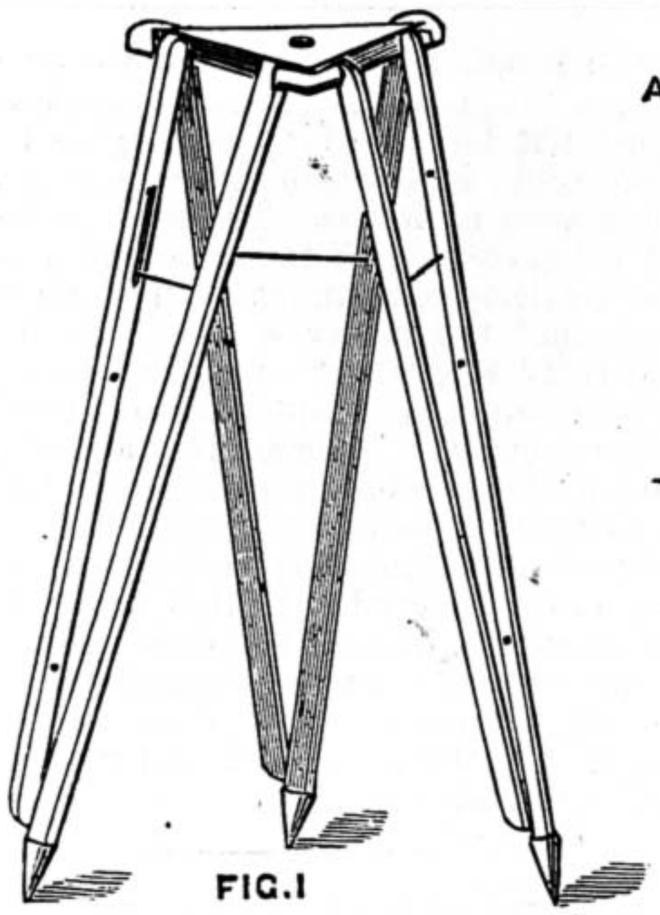
FIG.1

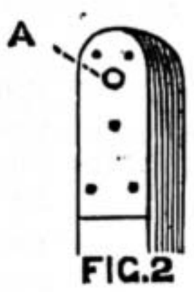

FIG.2

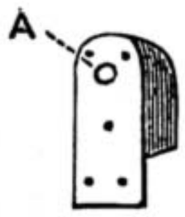

FIG.4

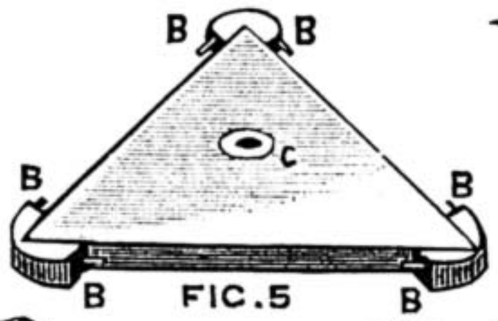

FIG.5

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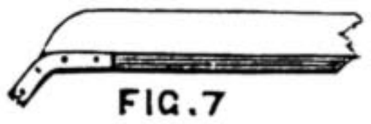
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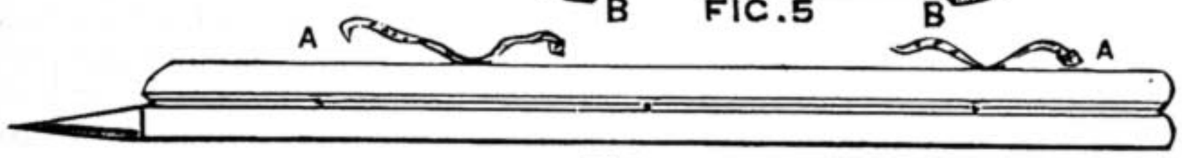

FIG.10

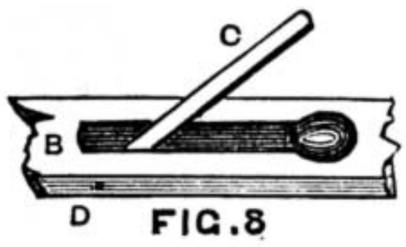

FIG.8

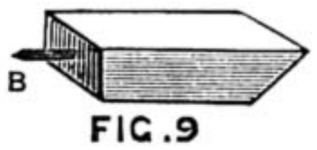

FIG.9

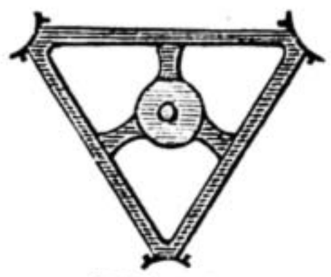
FIG.14

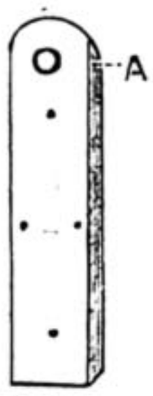

FIG.3

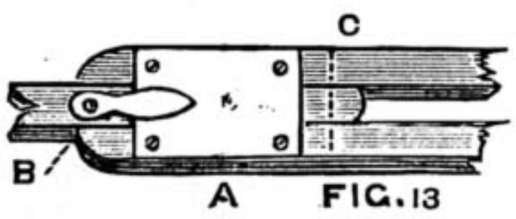

FIG.13

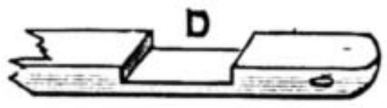

FIG.12

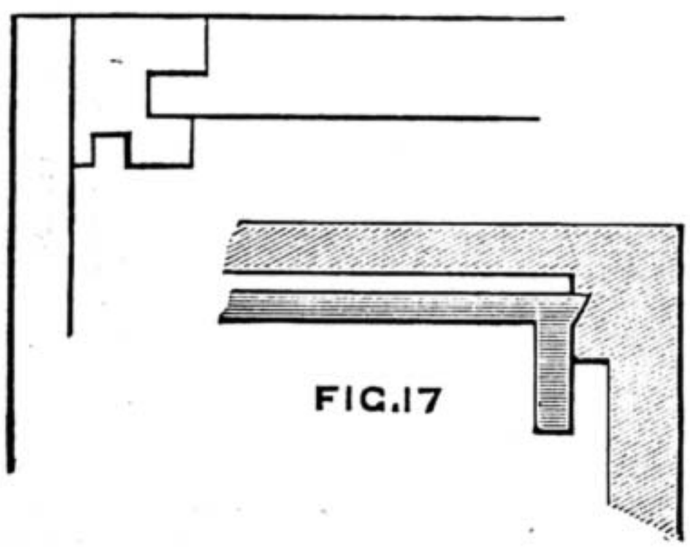
FIG.17

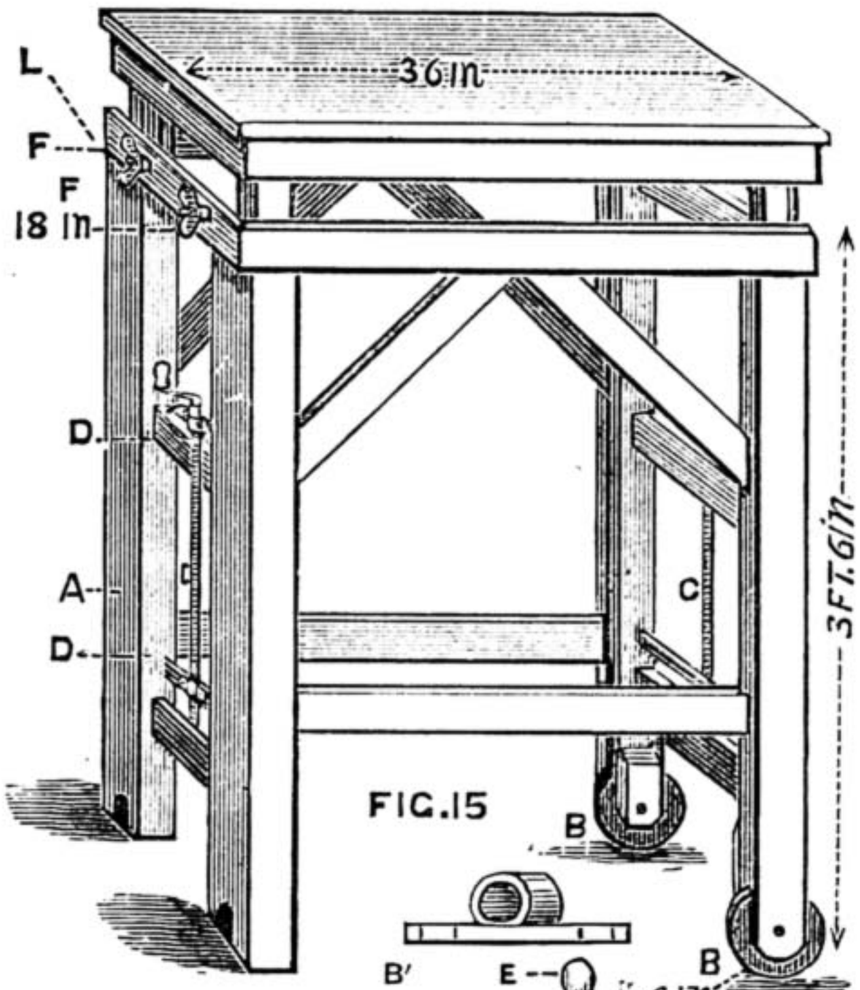

FIG.15

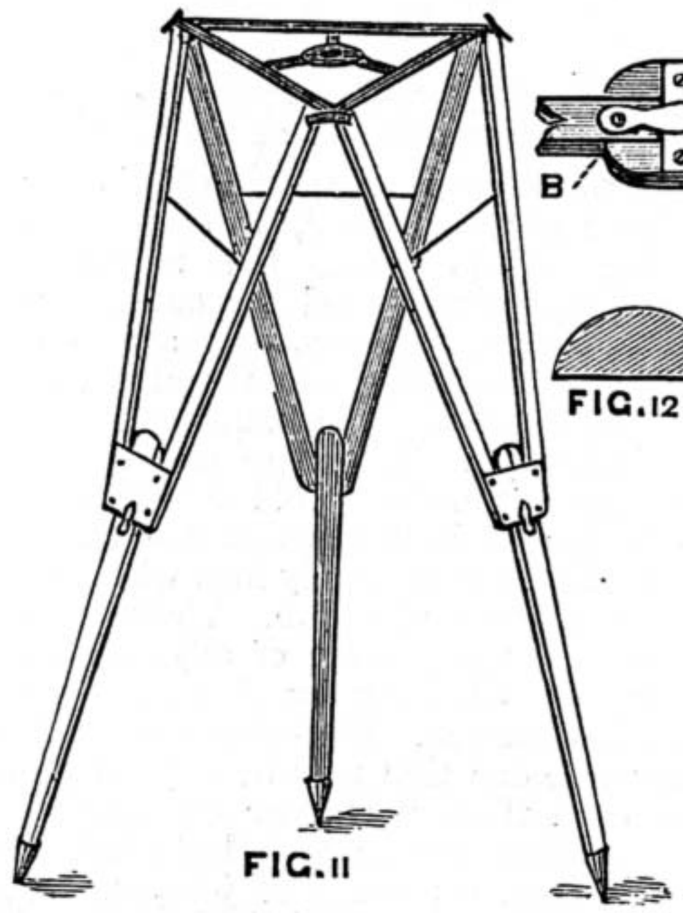
FIG.11

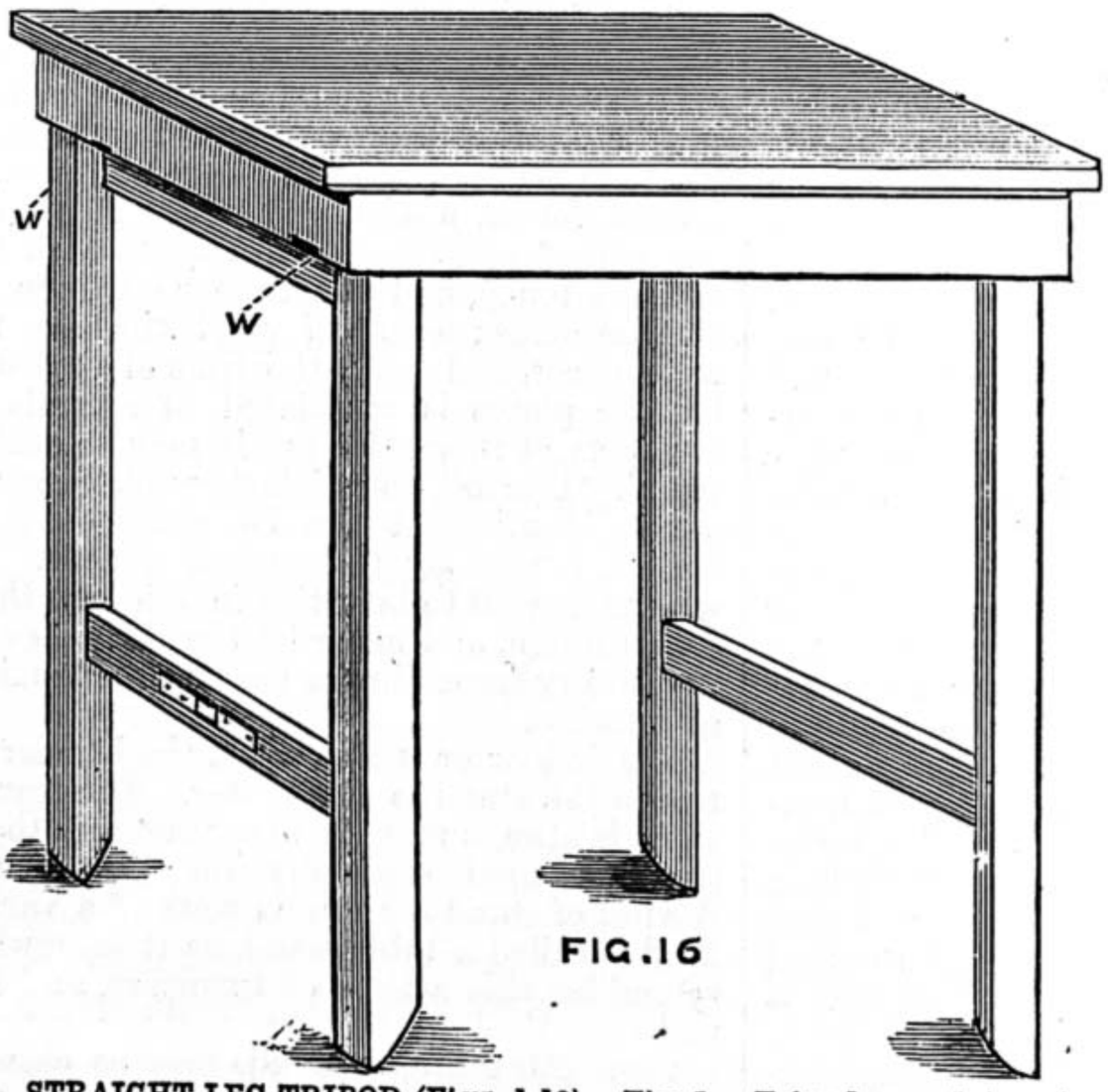

FIG.16

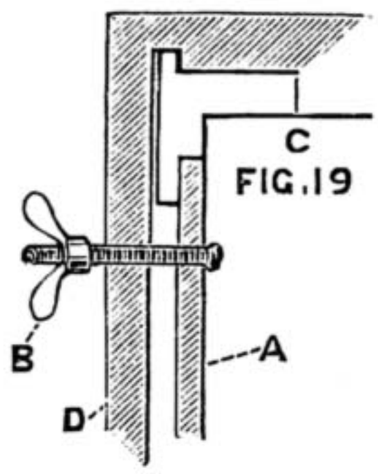

FIG.19

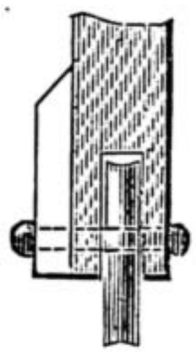
FIG.19 A

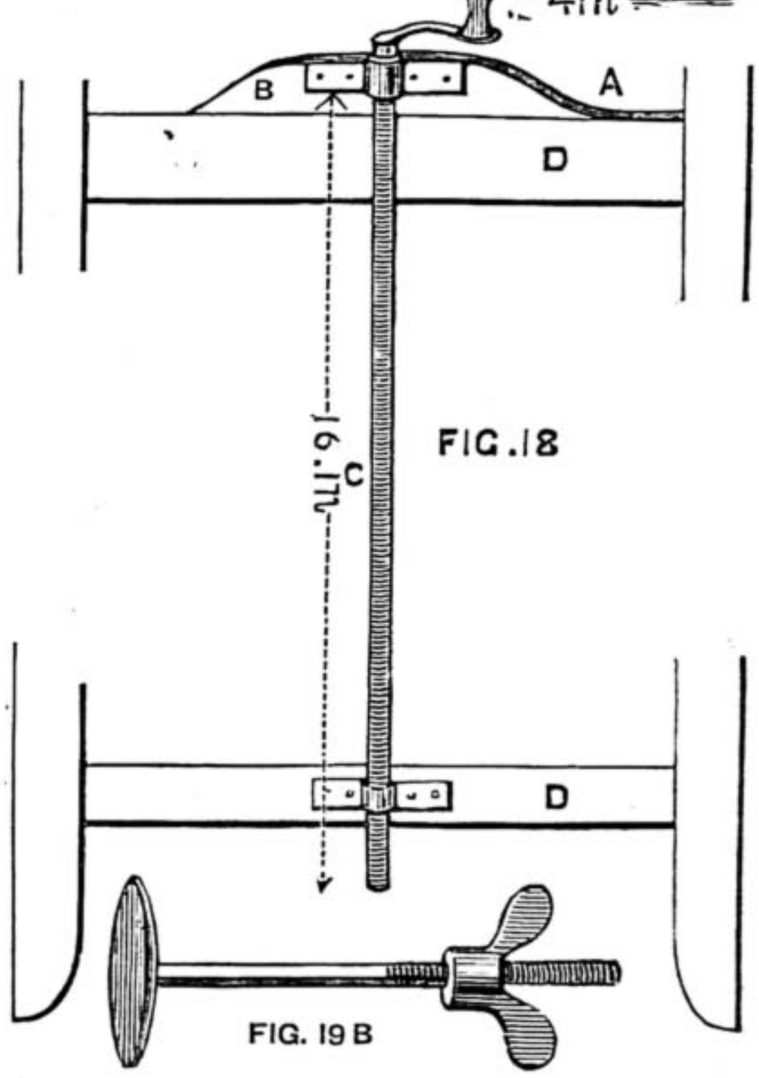

FIG.18

FIG. 19 B

STRAIGHT LEG TRIPOD (Figs. 1-10). Fig. 1.—Tripod complete set up for use. Fig. 2.—Upper End of Leg with Plate for attaching it to Triangle in Fig. 5—A, Socket Lined with Brass Tube to receive Pins of Triangle. Fig. 3.—Brass Plate for Upper End of Leg, detached. Fig. 4.—Brass Cap for Upper End of Leg. Fig. 5.—Wooden Triangle Top complete—B, B, B, B, Pins for Attachment to Leg; C, Hole for Screw to attach Camera to Tripod. Fig. 6.—Foot of Long Leg, showing Iron Shoe, C. Fig. 7.—Foot of Short Leg, showing Hinge. Fig. 8.—Part of Leg, showing Strut, C; B, Hollow to receive Strut when Legs are closed for Carriage; D, Pin to act as Pivot and secure Strut to Leg. Fig. 9.—Wooden Block with Pin for Point of Triangle. Fig. 10.—The Leg complete and folded—A, A, Straps. THE FOLDING TRIPOD (Figs. 11-14). Fig. 11.—Folding Tripod set up ready for use. Fig. 12.—Transverse Section of Leg. Fig. 13.—Part of Legs, showing how they are fastened together—A, Brass Plate; B, Button; C, Screw; D, Part of Lower Leg cut away to receive Plate when extended, so that Leg and Plate come flush and allow Button (B) to act. Fig. 14.—Brass Triangle, Top. *(For Continuation of Inscription, see next page.)*

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the attention of the constructor to the illustrations given in manufacturers' price lists for any additional modification that may take their fancy, and which by the exercise of a little skill they will be able to add to the designs here given.

The Straight Leg Tripod.—The material of which tripods of this form are made is usually ash, although deal, mahogany, and other woods have been used. Ash combines the qualities of toughness and rigidity, and is heavier than some other woods; but this is overbalanced by its lasting qualities and its power of withstanding a deal of hard usage without becoming disabled. Very useful tripods have been made of bamboo pointed together fishing-rod fashion. Deal is a very rigid wood, but not suitable for hard, rough usage, as it is liable to snap short off if subjected to sudden strain. Fig. 1 shows a complete tripod of the simplest possible form, and for practical usefulness not to be superseded by any other.

To construct a tripod, as in Fig. 1, procure some good seasoned wood, free from knots or shakes, cut out three laths 4 ft. 8 in. long, and three 4 ft. 6 in. long, 1 in. in width, and ¾ in. in thickness; round off the edges, and smooth them. One end of each lath is shaped like Fig. 2, and strengthened by a plate (Fig. 3) or cap of brass (Fig. 4); this strengthening is absolutely necessary, as the wood at this point is subjected to severe strain. The holes, A, are drilled to admit the pins, attached to the head (B, B, B, B, B, B, Fig. 5), fitting into them exactly, without any play; the holes may be drilled almost through the thickness of the wood, and lined with a short metal tube. The fitting of the head determines the rigidity of the apparatus when it is set up, so it is as well not to err on the side of lightness in the metal used. If a plate is considered sufficient, it should be made of brass $\frac{3}{16}$ in. thick, as Fig. 3. If a cap, it can be cast in one piece, as Fig. 4, or by bending a piece of brass round the top in addition to the plate, and securing it with screws on each side; but whatever plan is selected the brasswork must be sunk flush with the surface of the wood. The longer laths are then shoed, Fig. 6 being tapered to fit the iron sockets (Fig. 6, C), which consist of sheet iron bent into a conical shape, and brazed or welded, with holes drilled so that they can be securely riveted to the wood. The shorter legs are finished as in Fig. 7, a strong hinge being affixed thereto; the hinge is then screwed to the longer end, so that the upper ends of the legs are perfectly level. At six inches from the top of the shorter leg a groove is hollowed out 4½ in. in length (Fig. 8), in which an iron or brass rod 4 in. long (C) working on a pivot (D) at the lower end can be embedded in B flush with the surface of the wood. This is the strut or stretcher, which, when the tripod is set up, fits into a hole in the opposite leg to which it is attached, in order to keep them in close and firm connection with the top. The legs can now be well oiled and polished, two small leather straps, A A, being screwed on to one of the legs (Fig. 10), so that the whole may be made into a compact parcel when travelling. A leather strap handle is preferred by some; this can be also screwed to one of the legs centrally, so that a proper balance is secured when carrying it. The head of tripod may be purchased of metal as in Fig. 14, or made of wood as in Fig. 5. It is important that there should be no warping in this part, to prevent which three layers of ¼ in. mahogany, placed in different directions of grain, are glued together and dried under pressure. A triangular piece thus built up must be cut 8 in. on each side.

Now make six blocks, as Fig. 9, 1½ in. long, mitred and rounded off afterwards, in which the pins, B, are fixed, and from which they should project 1 in., and screw and glue one on each side of each point of the triangle (Fig. 5) and round off the points. The exact position of the pins should be such that when attached to the legs the ends of the legs should be level with, or rather below, the surface of the triangle. A quarter inch hole is now drilled through the centre of the triangle, strengthened on one or both sides by a circular brass plate (Fig. 5, C); the under part of the triangle, for about an inch on each side of the screw hole, may be slightly hollowed. This acts as a guide in screwing on the camera. It can now be polished, and it is a good plan to cover the upper surface with a piece of cloth or velvet; it gives a firmer bed for the camera, and prevents scratching, and altogether works more pleasantly than bare wood. This completes the ordinary single tripod.

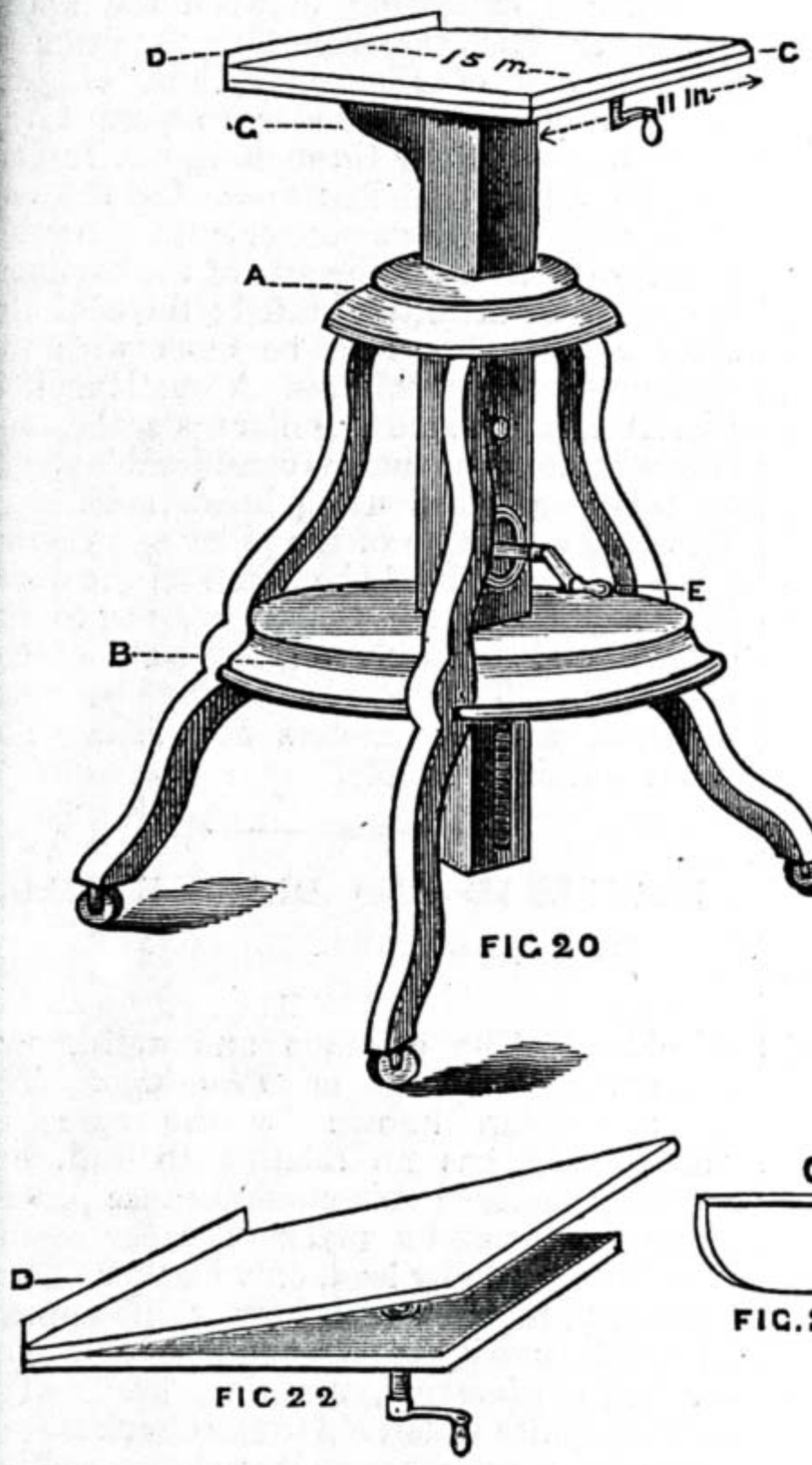


FIG 20

FIG 22

FIG. 20A

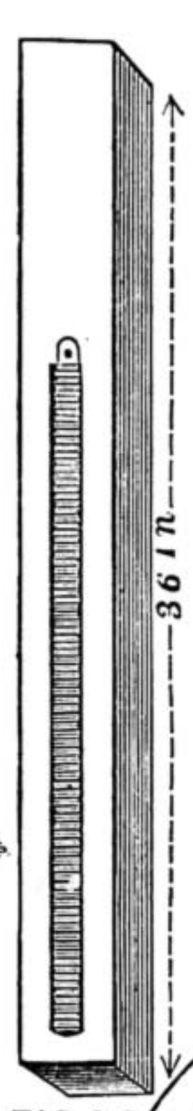


FIG 24

FIG. 26

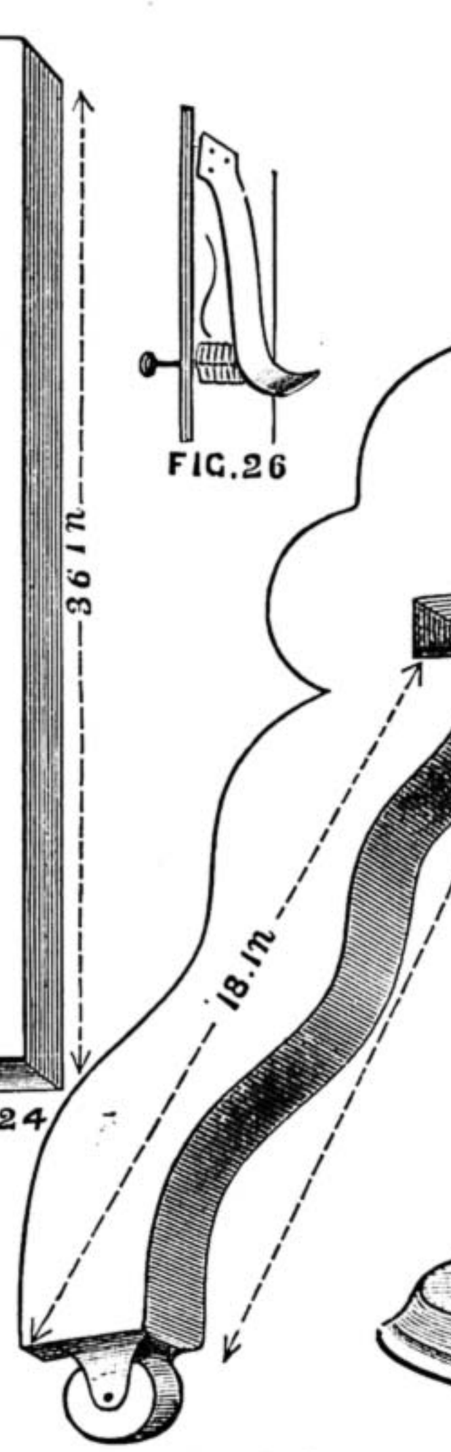


FIG. 21

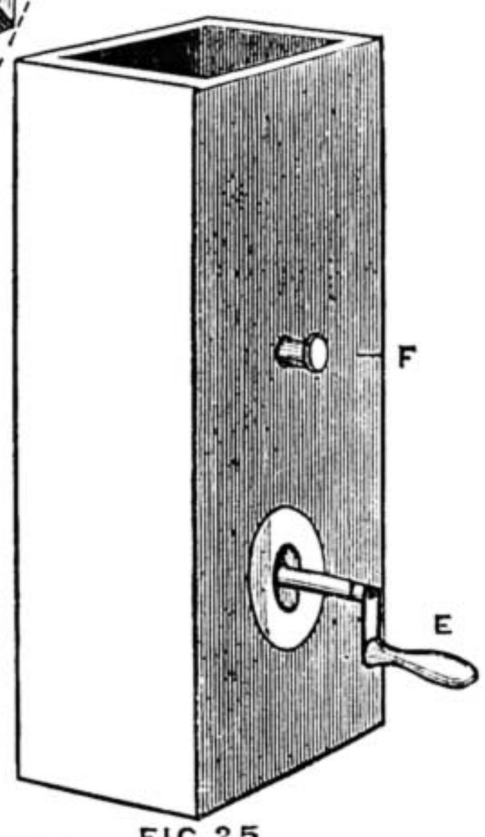


FIG. 25

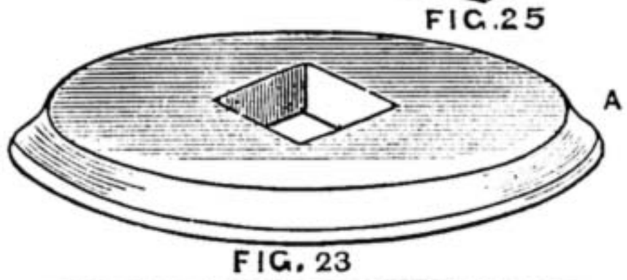
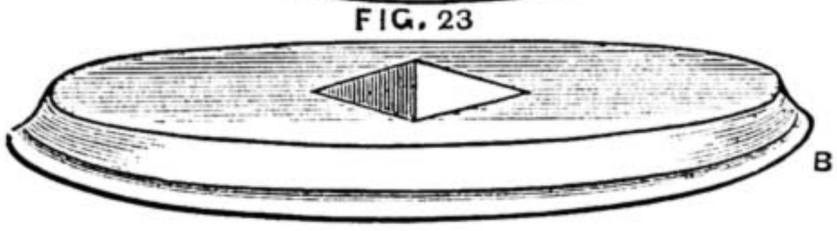


FIG. 23



THE TABLE STAND (Figs. 15-19). (*For Cuts, see preceding page.*) Fig. 15.—Table Stand ready for use, complete. Fig. 16.—Table and Sliding Frame with Hinged Top. Fig. 17.—Section of Inner and Outer Frame, showing Groove. Fig. 18.—Bars showing attachment of Screw for raising or lowering Table—A, Fitting to receive Collar B, B′, Collar shown separately; C, Screw; D, D, Bars of Sliding Table; E, Winch. Fig. 19.—Section of Frame, showing how Inner and Outer Frames are Clamped together—A, Clamping Bar; B, Winged Nut; C, Frame of Sliding Table; D, Upper Bar of Outer Frame. Fig. 19 A.—Enlarged View of Wheel of Front Leg (B, Fig. 15). Fig. 19 B.—Enlarged View of Screw and Nut for Clamping Bar (B, Fig. 19). THE STUDIO STAND (Figs. 20-26). Fig. 20.—Studio Stand complete. Fig. 20 A.—Enlarged View of Bracket G, Fig. 20. Fig. 21.—Leg of Stand. Fig. 22.—Double Top, hinged by two Strong Hinges in Front. Fig. 23.—Upper Circular Platform (A) and Lower Circular Platform (B). Fig. 24.—Central Pillar with Iron Rack. Fig. 25.—Outer Casing for Pillar—E, Handle for raising or lowering Stand; F, Spring Top. Fig. 26.—Spring Catch.

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The Folding Tripod.—Fig. 11 is one of the folding kinds, a thoroughly useful pattern, and for travelling its compactness is a great recommendation.

This kind of tripod varies from the straight leg tripod in the construction of the legs, the attachment to the head and the head itself being the same. Proceed to cut six pieces of ash, ¾ in. square and 31½ in. long; round off two corners; a section of the rod will be as Fig. 12. Round off the ends, and drill and cap as in the other case. Cut out three pieces of ash, 1 in. by ¾ in. in thickness and 27½ in. long; make them slightly taper for three parts of their length and shoe. To fix them together place one long piece on each side of the shorter one, overlapping 5 in., as in Fig. 13, and put a stout screw (C) through all of them an inch from the end of shorter leg; file off the point of the screw level with the wood. This acts as a pivot, and permits the legs to be folded. A plate of brass (A), 2½ in. in length and 2 in. in width, is attached by screws to the outer legs, the wood in the shorter leg being cut away the depth of the thickness of the plate, as at D, so that when the legs are opened out the plate will be flush with the surface of the wood, in order to permit a button (B) on the shorter leg being turned to keep the whole rigid and firm. The measurements for this stand are suitable for working with a whole-plate camera or lens. A six-inch triangle in brass (Fig. 14) is rather to be preferred to wood, as being more easily carried. If it is elected to make a wooden one, it can be made the same as already described, no alteration being required except that the space between the ends of the pins must be reduced to 4½ in., by shortening the sides of triangle and the pins themselves projecting ¾ of an inch. The struts may be made of strips of brass 4 in. long and ⅛ in. in thickness, let into the wood edgeways. The cell to contain them is best hollowed out somewhat above the end of the strut, to permit the more easy grasp of the brass by the finger end, as in Fig. 8. The same applies to the larger tripod. The usual polishing and straps complete the arrangements.

The Table Stand.—The table stand, shown complete in Fig. 15, is a much more elaborate piece of apparatus, and is especially useful for all kinds of copying work, and for portraiture, although for portraiture alone a smaller stand, and one that can be moved in all directions with facility, is to be preferred. The outside framework of this table is made of 2 in. stuff, the inner sliding frame (Fig. 16) of ¾ in. stuff. Deal answers every purpose. The outer frame (Fig. 15, A) is first made of the dimensions shown on diagram. The method of joining and grooving the corners is shown in Fig. 17; the two front legs are provided with 4 in. iron grooved wheels, B B, working in slots. The back legs are merely grooved at the bottom, to run on rails, for copying purposes. Two half-round iron rails are screwed to the floor of the studio, on which the table is pushed to and fro, the rails always keeping the stand in the same direction when moved backwards or forwards, an important point in copying; by slightly raising the back legs, the stand, even with a heavy camera on it, is easily moved. If no rails are used, good strong castors may be fixed to each leg; then the table may be moved in any direction with facility. The inner or sliding frame to which the table top is attached by hinges (Fig. 16) is constructed as shown, and is raised or lowered by endless screws working in collars attached to the end bars (Fig. 15 D). The screws, C C, are 16 inches long, which gives sufficient elevation for all practical purposes. The lower ends of the screws work through nuts on the lower bars, raising or lowering the table. A winch handle (E, Fig. 18) on the upper bar effects the movement; two stout pins, with screw threads (Fig. 19), only one shown in diagram (also see Fig. 15, F F), are attached to a bar pinching the inner sliding frame to the outer one at each end of the table, and passing through the outer frame, where by means of winged nuts the table may be steadied at any height. In order that either end of the table top may be raised at will, the top is hinged with two stout book hinges at each end to the framework supporting it (Fig. 16, W W). The upper part of the outer frame is braced together by two cross bars, not shown in drawing, made of ½ in. wood, and let into the lower side of the top frame (Fig. 15). This may now be stained and varnished, and the apparatus is complete. The advantage of having wheels only on the front legs is that the stand cannot be accidentally moved, it being necessary to raise the back legs before altering its position, the flat foot giving considerable grip of the floor. Both ends of the table are made precisely alike, with the exception of wheels. The clamping-bar, which is merely a piece of wood (Fig. 19, A) ¾ in. thick and 2½ in. wide, is retained in its place at the back of the upper bar of the outer frame (Fig. 15, L) by the screw, and when screwed up presses firmly against the legs of the sliding frame, Fig. 19 being a sectional diagram, C, frame of sliding table, B, winged nut pressing clamping bar A and D into close contact.

The Studio Stand.—The ordinary studio stand (Fig. 20) combines in a certain degree the movability, to coin a word for the occasion, of the tripod, with the solidity and firmness of the table stand. It is supported on three stout legs supplied with castors, so that it can be moved readily in any direction on the studio floor. The top, C, is considerably less than the table stand, and double—15 in. by 11 in.; and the wood ¾ in. thick. The double arrangement is in order to tilt the camera; the upper platform is supplied with a ledge, D, to prevent the camera slipping off when tilted. The lower part is supported on a bracket, G, whose shape is shown in an enlarged form in Fig 20 A. The upper circular platform (A) and lower circular platform (B) are shown separately in Fig. 23. E is the handle by which the pillar on which the top rests is raised or lowered. Fig. 22 shows the double top, hinged in front, and raised or lowered by a wooden hand-screw or a winch and screw; a 5-in. screw is sufficiently long, as it very seldom happens that more angle than can be obtained by this length is required. The screw should be a stout metal one, say ½ in. in diameter; each half of the top should be clamped to prevent warping. For legs cut out three pieces of wood, 2½ by 2 in., as in Fig. 21; they might be straight as far as utility is concerned, but the curves make them of more presentable appearance. The length from above the castors to the top is 3 ft. 4 in., and the height of the first circular platform from the ground is 18 in. The upper circular platform, Fig. 23, A, is made of 2 in. wood, and is 8 inches in diameter. The lower one, Fig. 23, B, is 2½ in. wood, and 15 in. in diameter, both nicely shaped at the edges, and with square apertures cut through the centre, just large enough to allow easy passage of a solid pillar of wood (Fig. 24), 2½ in. square and 3 ft. long; this is firmly screwed to the lower part of the top, into which it is let in about ¼ in. One side is provided with a strong iron rack about 20 in. long from the bottom of the pillar, which, when fixed in place, engages with cog wheels attached to winch handle, E, on outer case (Fig. 25) for the purpose of raising or lowering the table. In order to prevent movement after the table has been raised to the required height, by the weight of the apparatus, a strong wooden hand-screw or spring catch (Fig. 26) is fixed on the inside of the thin casing, which, engaging with the rack, prevents any downward movement. By merely pulling the knob F the rack is set at liberty, and may be lowered by the winch. The casing is made of ¾ in. wood, neatly joined, and extending between the upper and lower platforms, increasing the firmness and rigidity of the stand, and of just sufficient internal diameter to permit the pillar moving easily through it, not forgetting to allow sufficient space for the cog wheels and winding arrangements. As this entirely depends on the size of the castings, it cannot be definitely stated; three of the sides can, at any rate, be flush with the apertures in the platforms. A small bracket, Fig. 20, A, attached to the pillar under the table is an advantage, as there is considerable strain on this part when using heavy apparatus. With the exception of the pillar and casing, all sharp edges should be taken off the work. How much roundness shall be given to the legs depends entirely on the taste of the workman. The whole should be well polished, and the castors attached. The stand is then complete.

BLACKLEAD AND BLACKLEADING.

BY GEORGE EDWINSON BONNEY.

Blacklead.—The common and well-known name for *Graphite* or *Plumbago*. The black powder, known by the name of "blacklead," has no relation to lead, but probably received this name because pencils made of it caused a mark on paper resembling that made by lead, only blacker. This similarity, together with its metallic appearance, also gave it the name of plumbago, from the Latin *plumbum*, meaning lead. The name graphite is derived from a Greek source, and bears a reference to its use as a writing material. It is really a crystalline form of carbon found in the oldest sedimentary rocks. It is sometimes found associated with iron in its ores, and in some districts is found in the form of veins in the rocks. Its specific gravity varies from 2·15 to 2·35. This material is of great use to the electrotyper, since it enables him to coat a non-conducting surface of a mould with a conducting substance capable of reproducing the finest lines impressed thereon. For this purpose the very best graphite should be employed.

As there may be several opinions as to what constitutes the best, let me say that the best material for the electrotyper is that which rubs into a very fine powder of a dead-black appearance when undisturbed, but having a metallic lustre when rubbed or brushed on a surface. Coarse graphite is useless, however much it may be lauded by the vendor as being "pure as it comes from the mines." Much of this native graphite is too impure to be used for blackleading moulds.

"Coarse impure graphite may be purified by heating the powder with sulphuric acid and potassium chlorate; a compound is thus obtained which, on being strongly

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heated, decomposes, leaving pure graphite in a bulky, finely divided powder." (Roscoe.) Electrotyper's graphite may have its conducting power improved by mixing with it some tin or copper-bronze powder. Mr. Watt gives the following recipe for improving the conductivity of plumbago. "Dissolve 1 part of chloride of gold in 100 parts of sulphuric ether; this is then to be mixed with 50 parts of plumbago, and the mixture is exposed to sunlight, being frequently stirred until quite dry."

Blackleading or *Plumbagoing*.—The process of applying plumbago or graphite to moulds to render their surfaces conductors of electricity. Small moulds of coins and medallions are blackleaded by brushing in the fine plumbago dust with a sable or camel-hair brush or pencil. Larger moulds require larger brushes, which should always be soft; whilst those of printing electrotypes are blackleaded by machinery, the mould being fixed to a travelling carriage and caused to move to and fro under a vibrating brush. Every part of the mould must be coated with the conducting material, and the coat must be nicely polished to produce good results. Some electrotypists, it should be said, dispense with the dry blackleading process and adopt Knight's wet process. By this method the mould is coated with a thin wash of plumbago in water squirted on to it from a rose nozzle.

OUR GUIDE TO GOOD THINGS.

*** Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

91.—One Hundred Photographic Dodges.

This is a brochure which the publishers, Messrs. Piper & Carter, 5, Furnival Street, Holborn, offer to the public for 6d. It contains "One Hundred Photographic Dodges" collected, classified, and arranged by Mr. W. Inglis Rogers, with a number of interesting experiments with the camera, etc. The publishers assert on the wrapper that it is "the book you want," and a glance through it shows that it contains much that is useful and interesting. Here is one of the dodges—a telescope dodge, which runs thus:—"By fixing an ordinary telescope to the flange of the camera, pretty circular views may be taken of objects that would be too distant for the usual process, provided the camera is provided with a bellows that suits the focus of the telescope." Here is another—the sand dodge, a mode of vignetting, which is thus described:—"Make a shallow wooden box with a ground glass bottom (ground side downwards) with a rim below it to fit loosely over a printing frame. Having adjusted it over the frame, pour into it a quantity of fine sand, just enough to render the glass bottom opaque. Then with the finger form an oval of the required size and shape, and give the box one or two taps to equalise the sand. When required to examine the prints, lift the box off bodily. By piling up the sand on the centre of the plate, the margin may be tinted to any desired extent." The production of head on plate is thus described:—"This curious phenomenon is produced by getting the sitter to hold half a plate against his throat above his collar and covering the remainder of his body, including the hands, by hanging a black cloth in front. Then cover the face, get the sitter to hold out his right arm, as if in the act of holding something, and take another plate *without shifting the camera*. In printing, superpose, so as to get the bodiless head with plate beneath exactly over the outstretched hand." I have given in the above a fair sample of the nature of the "dodges," and I must now leave it to my readers who are also photographers to decide whether or not it seems desirable to purchase the book.

92.—Lansdell's Improved T-Squares and Set Squares.

I have received from Mr. Mark J. Lansdell, A.R.I.B.A., Architect and Surveyor, of Bedford Row House, Bedford Row, London, W.C., a specimen in the form of a set-square of his improvement in the manufacture of T-squares, set-squares, and other analogous appliances. These improvements are embodied and described in Mr. Lansdell's Specification of June 28th, 1888, No. 9442, which is now before me; they may be applied not only in the construction of the appliances already named, but to centro-lineads, flat rulers, and all similar appliances and apparatus used by draughtsmen and others in setting out and drawing on cloth or paper representations of architectural, mechanical, and other objects of like character. Mr. Lansdell shows that "as at present manufactured, such appliances are made with flat sides, the whole surface of each of which, or of each part of which, as in French curves, lies in the same plane, and, consequently, rests on the paper or other material on which it is used, causing an unnecessary amount of frictional contact therewith at each movement, and soiling the same by rubbing thereover the detached particles of pencil dust and other matter which adhere to its under surface. Such disadvantages are especially apparent in those of such appliances which are used indiscriminately with either side as the underside, as the moisture from the hands which adheres to the top side for the time being stains the same, and, when the appliance is turned over, causes particles of pencil dust and other matter to be liable to be attracted and to closely adhere thereto, and in the movement of the appliance over the paper such particles are rubbed in contact with the paper or material, and necessarily soil the same and injure any fine work thereon."

I have myself frequently experienced the detrimental effects of the continuous contact of the paper and the appliance placed upon it for the purpose of drawing or setting-out lines, throughout the entire superficial area of the latter, caused mainly by the drawing of particles of lead pencil dust over the surface of the paper when set-square, T-square, ruler, or curve has been moved, and I have also learnt that the removal of such blemishes is a very difficult matter. The great object, therefore, is to prevent contact between the opposing surfaces of paper and appliance. This, at first sight, may seem an insuperable matter, but Mr. Lansdell has been able to show us that the remedy is, after all, but a simple one, but none the less ingenious because marked with simplicity. Briefly described, his plan is to recess the sides of the instrument, be it what it may, so that a narrow strip along its edge or edges is the only part which comes into immediate contact with the material, whether cloth, paper, or cardboard, on which it is placed. Thus the contact is reduced to a minimum, and although the danger of defacement as the instrument passes over and along the surface of the material is not entirely obviated, yet it is reduced to a minimum. In the set-square sent to me as a sample, the piece of thin mahogany is barely $\frac{1}{16}$ inch in thickness, and it is edged on each side with what has the appearance of being a very thin piece of veneer about the thickness of ordinary cardboard and rather more than $\frac{1}{8}$ inch in breadth. The thickness of the mahogany itself and the edgings laid upon it on both sides is less than $\frac{1}{8}$ inch in thickness. To prevent any objection that might be raised to the effect that the substance of the mahogany being so very slight, and the edging itself extremely thin, the central part of the appliance might be brought in contact with the material on which it is placed under pressure of the hand, two small studs of the same height above the surface of the set-square as the edge itself are placed on the mahogany on each side. Of course, there are other modes of effecting the recessing, and notably that of hollowing out the surface of the appliance on both sides, leaving only the extreme edge to rest on the paper, the section of depression from edge to edge being a curved line. I am not aware that rulers and appliances made on Mr. Lansdell's principle are yet on sale; if so, I daresay he will kindly tell us where they may be had, as, doubtless, many readers of WORK would wish to become possessed of them. That they are made in vulcanite I learn from Mr. Lansdell's letter to me, in which he says:—"Vulcanite set-squares of the ordinary thickness would be moulded with recessed body part, and I have had several in vulcanite distributed for a long time in different architects' offices, all of which, from letters received, appear to have given the most complete satisfaction." I cordially agree with such expressions of approval of Mr. Lansdell's invention, which I regard as being a most useful one, and this, I think, will be the opinion of all who are induced to make trial of it.

93.—"Laundry Management."

"Laundry Management" is the title of a useful and comprehensive work on the laundry, the work done in it and the appliances that are used in it, written by the editor of the *Laundry Journal*, and published by Messrs. Crosby Lockwood & Son, 7, Stationers' Hall Court, Ludgate Hill, London, E.C. It purports to be a handbook for use in public and private laundries, and includes descriptive accounts of modern machinery and the apparatus necessary for laundry work. "Laundry Management" is divided into two parts, the first of which deals *seriatim* with the operations and processes generally carried on in the best English laundries. Thus, sorting and marking linen, disinfecting by various means, including chemical agents, fumigation, hot air, and steam, and water and water softening, a subject of the utmost importance, are first treated, and the writer then proceeds to soaking and the removal of stains, washing, rinsing, wringing and drying, blueing, starching, mangling, ironing, completing this branch of his subject with instructions on washing flannels and blankets, curtain and lace cleaning and ironing, and cleaning generally with regard to textile fabrics, leather, and numerous articles that cannot be subjected to the operation of washing. This portion of the work will be found especially useful to those who are about to commence business as laundrymen, and will also show many who are already in the trade, as well as those housewives and housekeepers who desire the highest results, how to set about the business of dressing and washing linen in the best and most economical way.

The second part deals with the planning and installation of laundries, and the machinery to be used therein. Here the writer passes over in review first the laundry buildings with the arrangement of the different departments and the means of securing proper ventilation. After this, machines for washing, hand-power, automatic, and steam power, are brought under the reader's notice; then machines for rinsing and the extraction of moisture, such as wringing machines. Drying machines, box and roller mangles, and ironing machines are next considered, and the book is brought to a close with a chapter on carpet-beating, and with another on some appliances and apparatus connected with the laundry and laundry work that have not found notice in previous chapters. Books likely to prove of service to laundrymen form the subject of the last paragraph: "A Treatise on Steam Boilers," by R. Wilson, C.E.; "A Text-Book on the Steam Engine, with a Supplement on Gas Engines," by T. W. Goodeve, M.A.; "Stationary Engine Driving," by Michael Reynolds; and "The Safe Use of Steam," by an Engineer. To the value of the last brief, but comprehensive, little pamphlet, I can bear ready testimony.

THE EDITOR.

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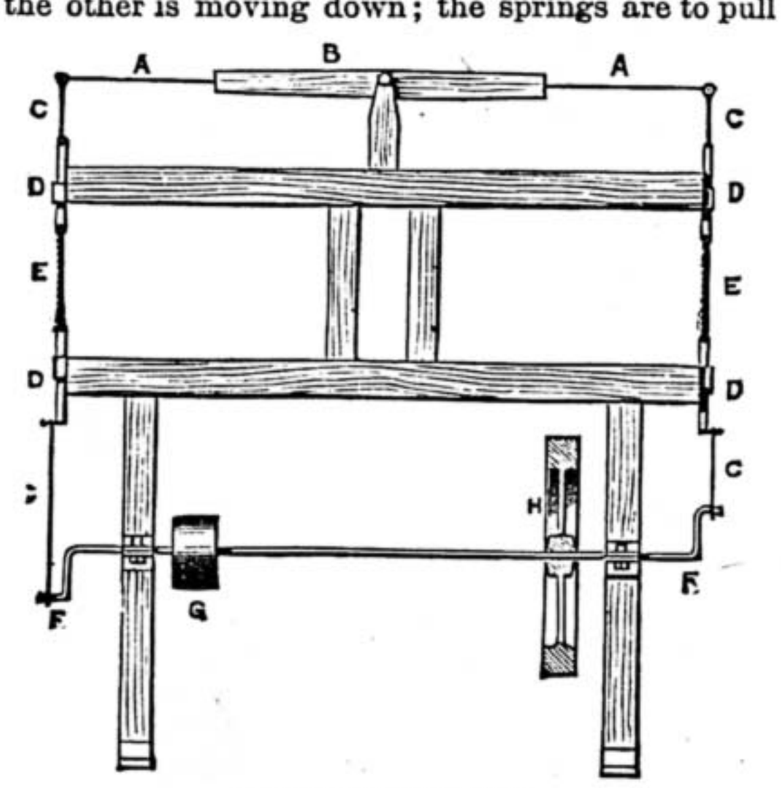
SHOP:

A Corner for Those who Want to Talk It.

*** Notice to Correspondents.—*In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of* Work *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Double Scroll Saw.—Artist in Wood writes:—"I forward a sketch of a double scroll saw for coarse and fine work, that I think would run very steady at high speed, one saw to move up when the other is moving down; the springs are to pull



Double Scroll Saw.

A, A, Springs. B, Rocking Beam. C, C, Rods. D, D, Slides. E, E, Saws. F, F, Cranks. G, Driving Pulley. H, Balance Wheel.

the saws tight, and will not bend much when the saw is in use. The plan is a new one, and no machine has been made like it."

Ebonising Door Knobs.—E. P. W. (*Warrington*) writes:—"I notice in 'Means, Modes, and Methods,' instructions showing how to ebonise door knobs, and it has put me in mind of something that would answer the same purpose. We used to stain mouldings for picture frames to imitate rosewood when I was an apprentice. Put a good handful of logwood into a saucepan, cover it well with water, and boil it until it stains a red. Drop in a little pearlash, and dry it on a piece of wood until it gets a rich colour; then put on with a brush while hot. When it is dry put the same stuff on the fire, and add a little bichromate of potash, and you have the black. To make the dark grain get a large feather, and cut it so that it will make three or four streaks at once, and you can grain rosewood like fun. I think the same would answer for door knobs. I am waiting patiently to see articles on violin making."—[Your patience will soon be rewarded.—Ed.]

Subjects in Work.—F. M. (*Glasgow*) writes:—"I am highly pleased with your paper Work, and I anxiously wait on it every Thursday morning. I am much annoyed to see the way you are attacked by some of your readers regarding the subjects which are treated from week to week. Some of the readers appear to me to think that you should give them a paper with an article on every subject under the sun every week. The idea, I think, is preposterous. What I write this letter for is to ask you when I may expect an article on the building of small cottages, etc. I have seen several anxious inquiries about this subject, and I think it would take well. I do not wish to push you too hard, for I see every man wants to see his own trade treated first, and of course some article must stand back. An answer through the columns of your valuable paper will much oblige."—[Pray do not be annoyed at the onslaughts on editorial work and arrangements, as I can assure you they do not trouble me in the least. Once on a time there was a big burly blacksmith, whose wife—an exceedingly small woman—was afflicted with a waspish temper to such a degree, that at times, utterly ignoring her marriage vows, she would assault him with a broomstick. One day a friend asked him how it was that he permitted such a little specimen of the gentler sex to treat him in so ignominious a manner. "Well," said the good-tempered fellow, "you see, it pleases her, and it doesn't hurt me," with which answer the friend was doubtless satisfied. I hope the moral to be gathered from this storiette will be equally satisfactory to you. The papers on building will appear in due course; but I never commit myself to specific promises, lest anything unforeseen should prevent me from coming up to time.—Ed.]

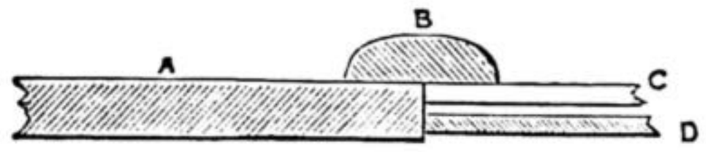
II.—Questions Answered by Editor and Staff.

Photography.—Greenhorn (*Greenock*).—If by "American photos" ferrotypes are meant, it is merely the wet collodion process on ferrotype metal plates instead of on glass. Any treatise on wet collodion will give instructions. A very good shilling hand-book is published by J. Werge, Berners Street, Oxford Street, W., fully treating on positive work, and may be had of him; and there is Hepworth's "Photography for Amateurs" (1s.). In fact, any elementary book on glass positives will afford the information sought.—E. D.

Camera.—M. J. M. (*Aberdeen*).—The plan of folding and making a camera bellows will be found in Work, No. 23, page 359, as simple a form as possible, in the article on "A Whole Plate Camera." Instructions with regard to camera are also therein contained.—E. D.

Electro-gilding.—Aqua Regia (*York*).—I have never seen any gilding that will match the green gold used in some of the French work. I know how to make the gold that colour, but I doubt that gilding can produce it. As to oxidising, I used to use a solution of hydrosulphate of ammonia, but it made such an unpleasant smell, that I now send both oxidising and gilding to my gilder. However, I should use it again if necessary, and for that purpose the work, if of silver, would have to be quite clean, and if of brass, it would have to be electro-plated. The solution should be made with warm water—about one part of hydrosulphate to ten of warm water. Immerse the work until it gets the colour desired, either black, or dark brown, or bluish. Then rinse it in clean water, and dry it in boxwood dust. It will be improved by a final rub with a soft chamois leather.—H. S. G.

Glazing Fretwork Photo Frame.—J. W. L. (*Middlesborough*).—The easiest way by which you can secure glass to your oval fretwork frame is to cut an oval rim, with an opening slightly smaller than that in the frame, and glue it on to this. You will see by this arrangement that the rim forms a rebate, into which the glass will fit, and that it will require no fixing beyond the support afforded by the backing which you will naturally put in behind the photograph. The rim, of course, can be moulded instead of being left with plain edges, but from your inquiry, I judge this will be more than you can accomplish. You will, however, experience very little difficulty in rounding the edges off with any convenient cutting tool, and then smoothing down with glasspaper. The accompanying diagram,



Section of Photo Frame.

showing part of your frame with rim attached, will make everything clear to you: A, the fretwork frame; B, rim; C, glass; D, back cover. Yes, certainly, French polish can be applied to Canadian oak, though oiling or waxing will be easier.—D. A.

Polishing Gunstock, Pear-tree Wood, Gasoline, and Marks on Carpet.—J. McW. Iernus (*Tarbert*).—If your gun is a common one, varnish may have been used, but oil polishing will be preferable if it is a good one. All you have to do is to rub some raw linseed oil into the wood, which, however, must not be saturated. A little oil and much dry friction produce the best results. The more you rub the better the polish will be. Pear-tree wood is suitable for any of the purposes you name, and for furniture generally. It is an admirable material for carving. I am sorry I cannot help you about "gasoline," as, not knowing what it is, I am unable to tell you where it can be got. I may be familiar with it, but under some other name. The "silvery marks" you ask about can only be formed by snails or slugs; at least, none of the carpets I have ever seen have been subject to silvery marks in the morning unless they had been gone over by snails, etc. As you say it could not possibly be these in your case, I am afraid you must endeavour to find some unique cause with which I am not acquainted.—D. A.

Sundial.—Joe Spivens.—A paper or two on the construction of the sundial shall be given as soon as room can be found for them.

Soldering as treated in Work.—D. C. B. (*Reading*).—It is a matter of satisfaction to all who are concerned in the production of Work to find that the papers that appear in it are generally liked and valued by those for whom they are written. With respect to Mr. R. Alexander's paper on "Soldering," which appeared in No. 17, page 257, you write:—"I am glad to say that the first of the articles on tin work has quite come up to, in fact has gone beyond, my expectations. I must say that the article is clearly and explicitly written, so that no one can fail to thoroughly understand how to proceed in this branch of work." I hope, with yourself, that Work will supply the lack of a Technical Institute in many places, or, what is better, pave the way to the establishment of technical institutes. I am obliged to you for your efforts to increase the circulation of Work by introducing it to your friends.

Taxidermy.—E. R. (*Swansea*).—The art of stuffing and mounting birds and animals generally, and the preparation of the skins, will be taken in hand eventually, but it is not possible to commence them yet a while.

Metal Engraving.—R. E. B. (*South Petherton*)—Some excellent papers, well and efficiently illustrated, on this subject are in the hands of the printer and engraver, and will be commenced shortly.

Circular Saw.—Circular Saw (*Clapton*) has a saw 16 in. diameter driven by a 5 ft. 6 in. driving wheel, the proportions of the driving wheel and saw pulley being ten to one; and being turned by hand, it is both hard and slow work. Here double gear must be used to get up speed. A circular saw should properly be speeded to run at about 6,000 feet per minute at the periphery. Your saw being 16 in. in diameter, its circumference is 50¼ inches, or, say, approximately 4·16 feet in circumference. Then $\frac{6000}{4 \cdot 16} = 1442$ revolutions of saw per minute. The driving pulley is 5 ft. 6 in. diameter, and the saw pulley, in the proportion of ten to one, is 6·6 in. Say you leave this 5 ft. 6 in. pulley, as at present, on the first motion shaft, and drive thence to a pulley on an intermediate spindle, and on this same spindle drive from another pulley to the saw. Then assume that you turn your 5 ft. 6 in. pulley at 40 revolutions a minute, and speed your intermediate shaft at five times 40 = 200 revolutions. Then $\frac{66 \text{ in.} \times 40}{200} = 13 \cdot 2$ in.; that is a pulley 13¼ in. diameter should go on the intermediate shaft. Then $\frac{1442 \times 6 \cdot 6 \text{ in.}}{200} = 47\frac{1}{2}$ in., the proper diameter of the pulley driving from the intermediate shaft to the saw. So that you will have your first motion pulley turning at 40 revolutions per minute, driving on to a 13¼ in. pulley, and on the same shaft as the latter, a 47½ in. pulley driving on to the 6⅝ in. pulley on the saw spindle, so running at 1,442 revolutions per minute, or 6,000 feet peripheral speed. Though I give 6,000 feet per minute, some saws run at less, others at greater speed, and you can modify your sizes of pulleys if you so desire. If you have the pulleys too close together, the belts will slip with heavy cutting, so put them as far apart as you conveniently can. If your space is contracted, then a good device is to cover the pulleys with leather to increase the bite of the belts.—J.

Medical Coil.—Bernhard writes:—"I thank G. E. B. for his reply to my query, battery for medical coil, in Work, June 22nd. I have tried the coil with plates exposed to solution, 3½ × 2½, and the carbon full ⅜ in. from the zinc. Every section works well, giving powerful currents. The contact-breaker works well—very brisk; but I wish to know if the positive electrode must be smaller than the negative."—In a small pamphlet I have on the subject, directions are given for the treatment of over fifty diseases, but no mention is made of any required difference in size between the two electrodes, except where necessary for the application of the current to particular parts of the body, as, for instance, to the inside of the mouth. This pamphlet I had with a magneto-electric machine some years since, but it lacks the name of author and publisher. Some of the information is unfit for publication in Work. Perhaps some of our readers can oblige Bernhard with the title and price of a book giving full directions for the treatment of diseases by means of a medical coil.—G. E. B.

Newspaper Rack.—T. A. C. (*Maidstone*).—Unless you are familiar with the work, it is impossible in the limited space of "Shop" to give you sufficient directions to enable you to make newspaper racks. Papers on cane (bamboo) work are in hand, and among the articles will be a newspaper rack which will probably be of use to you. Owing to the pressure of more important subjects, it is, however, impossible for much attention to be devoted to this one at present. Rest assured, though, that in due course full particulars will appear. Meanwhile, if you like to send a rough sketch of the thing you contemplate making, we will see what assistance can be given you in these columns.—D. A.

Pearl for Inlaying.—W. C. M. (*Barrow-in-Furness*).—Messrs. McCallum & Hodson, Summer Row, Birmingham, prepare pearl of the various sorts for inlaying papier-mâché. The same pearl is, we imagine, what W. C. M. requires for his glass work.—S. W.

Bedroom Suite.—J. C. B. (*London*).—For sizes of 4 ft. 6 in. bedroom suite, those I have given here will be found as convenient and useful as any. I do not say that they are the exact dimensions to which makers in the trade generally work, as they have to economise their wood, in a great many instances, for certain reasons. The extreme outside measurements of the wardrobe would be: height, 6 ft. 6 in.; width on the front of the plinth, 4 ft. 6 in.; width on the side of the plinth, 20 in. The toilet table should be 29 in. from the floor to the top, 4 ft. wide, and 20 in. from back to front, the jewel boxes 13 in. wide along the top, 10 in. at the side, and 5½ in. high. The glass frame ought to be 24 in. by 20 in. without the top moulding. The top of the table should overlap the framing by ¾ in. all round. As the legs are turned out of 2½ in. stuff, this will bring the drawers to 20½ in. by 5 in., divided by ½ in. partition. The total depth from the table top to the bottom of the under framing should be 7 in. The jewel drawers will each be 11 in. by 4 in. The sizes of the pedestal pot-cupboard are: height from floor to top, 25 in.; width along the front of plinth, 14 in.; along the sides of the plinth, 12 in. The washstand will be made according to the table measurements. The

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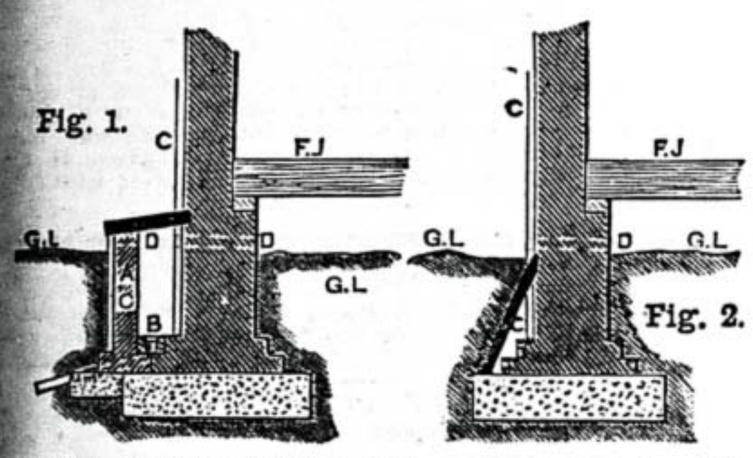
back, if one row of 6 in. tiles is used, should be 47 in. wide and 9 in. high; for every other row of tiles, increase 6 in. Chair and towel-rail it is unnecessary to give sizes of, as I do not suppose that J. C. B. or any one else would wish to make them, as they can be bought at very reasonable prices; and, moreover, a man may be able to make a firm solid job with boards, but it requires a different kind of skill to make chairs and towel-rails to preserve their entirety for any length of time without "squeaking."—J. S.

Dry Area.—E. T. (*Blackheath*).—The two sections annexed give the details of dry areas. You will at once see that there is a certain amount of work to be done underground. In any case, it is necessary to dig out the ground until you expose the footings and concrete foundations (it is assumed that they exist). In section in Fig. 1 you will notice a retaining wall, A, of sufficient strength to keep back the ground, built on a concrete foundation, which may be from 6 in. to 14 in. (or more if you have room) from external wall of house, and covered at the top with stone slabs built into existing wall, one or two of which should be left loose for the purpose of examination from time to time. The floor of area thus formed should be covered with cement concrete, and a gully, B, let into same at the lowest level, and connected with drain pipes carried through retaining wall, A, into loose earth beyond, to carry off any moisture that might accumulate. Both the walls on the faces marked C should be



Details of Dry Areas—F.J., Floor Joist; G.L., Ground Line.

rendered with cement, or, better still, with asphalte. At the point marked D insert air bricks here and there along the length of walls for ventilation. The area could be left open at the top, but that would necessitate more care being given to clearing out same. As to the drainage at B, section in Fig. 2 shows a method sometimes adopted, which is simply slabs of stone leant against the building and the earth filled in, but the former method is recommended, unless you are confined for room. If cheapness is a consideration, after digging out the ground, the external face of existing wall may be left with the face, C, rendered as described for section in Fig. 1, or covered with slates or damp proof felt nailed to wall and the ground filled in. Whichever plan you adopt, I should at least carry it round the corner of dining-room, for I have frequently noticed that moisture travels by capillary attraction some distance along a wall before showing itself inside. And on no account disturb the slate damp proof course which you notice, for although it is a method open to a great many objections, I have no doubt but that it was originally put there with the best intentions.—E. D.

Paper Replicas and Picture-Frame Compo, etc.—A. E. (*Liverpool*).—For a reply to the first part of your letter I must refer you to the answer given to a similar inquiry by G. M. in No. 13, page 206. With regard to your other questions, I do not quite understand whether you require a receipt for making the picture-frame "compo" or not. However, I give the best I know of:—Melt 7 lbs. of best glue in 3 pints of water; melt 3 lbs. of resin in 3 pints of linseed oil. While hot, mix all together and boil for half an hour, being careful to avoid boiling over. Then mix in gradually finest whiting until of the consistency of dough; knead well, and press into moulds while hot. If the lump of "compo" becomes cold and therefore hard, it must be well heated before a hot fire, or in an oven, etc., when it will become workable. The moulds used are generally of boxwood, and the making of them affords scope for any amount of skill in carving, their negative character rendering them rather difficult.—OPIFEX.

Bell Telephone.—IERNUS (*Tarbert*).—Any kind of hard-grained wood will do for the body of a bell telephone; mahogany is commonly used. I made mine with this wood, and I find that after years of use they are still perfect. The magnets should be almost the entire length of the case or body. If you make your case 6 in. long, which is about the usual size, make the magnets 5½ in. long by ⅜ in. diameter. The diaphragm and coils will depend upon the dimensions of the case for their size also. Assuming the case to be the size mentioned above, let the diaphragm be made 2¼ in. in diameter. Make the space in the case to hold the coil 2¾ in. by ¼ in.; then the coil bobbin should be 1¼ in. by ½ in. On the bobbins wind ¼ oz. of No. 36 silk-covered copper wire; I cannot give you the quantity in yards, as this fine wire is always weighed instead of measured by the yard. There should be no difficulty in getting the materials. I do not know the address of any firm in Ireland where you could get them; but if you write to Messrs. King, Mendham, & Co., manufacturing electricians, Narrow Wine Street, Bristol, I am sure you will be able to get all you want. But I thought you were going to make your telephones. You can do this nicely if you have a turning lathe; all you will require to buy ready made is the wire for the coils. If you want further details, write again.—W. D.

Pattern-Making Book.—TOM SMITH.—Hasluck's "Pattern Maker's Handy-book" (2s.), Stationers' Hall Court, London, may answer your purpose. Your other questions will be answered in due course.—F. J. C.

Flight of Stairs.—A READER OF WORK (*Accrington*).—As you do not mention what kind of stairs you want, or give any particulars as to position, size, etc., I take it that you mean a plain straight flight of stairs, so I have purposely omitted any mention of newels, winders, etc. First, take the distance from floor to floor, and cut off a rod to this length; then divide it into as many equal parts as near 7 in. as possible (Fig. 1); this is called the height rod. You will notice I give the height at 6 ft. 5 in., which gives you eleven steps, or, practically speaking, ten and up. Now determine how far you can allow the stairs to spread out, and divide this into ten equal parts, each part being as near 9½ in. as possible (Fig. 2). I have taken this at 8 ft. 8½ in. Of course I only take the height at 6 ft. 5 in., and the length or going at 8 ft. 8½ in., for the purpose of simplifying the explanation. But the 7 in. rise is about the general height for this class of stair. There are several ways of determining why the going should be about 9½ in. if the rise is 7 in., but it is quite unnecessary to go into this now. Now take a piece of any hard wood about ⅜ in. thick, and shoot one side and one end perfectly square and true, just as if you were going to make a plain set square, and on one side set off the going, which we have determined shall be 9½ in., and on the other 7 in., which is the rise. Connect these two as Fig. 3, and this will give what is called the pitch-board. Great care should be taken in making this, for the pitch-board is the principal, or, I might say, the secret of staircase making; for, unless it is perfectly square and true, the tread of your stairs will not be level when you get them into position, if you get them into position at all. The staircase I am describing is called a housed string stair, so called because the treads and risers are housed or grooved into the strings. I need hardly say that the strings are the pieces which reach from floor to floor, and into which the treads and risers are housed; the one next the wall is called the wall string, and the other the outer string. The next step is to plane up a piece of 1¼ ft. 9 in., about 13 ft. long on one side, perfectly straight and out of winding, and gauge it to a width as wide as it will go for the wall string. Then draw a line along the entire length 1¼ in. from one edge, place the longest side of the pitch-board (marked A in Fig. 3) on this line, and starting about 9 in. from the left-hand end, mark off as many triangles or steps as you require (Fig. 4). You will notice that you will want ten and one extra (or what is called up), the riser of step 11 or up giving the line of joint between top of wall string and the skirting on floor or landing above, and the line of going or tread giving the bevel of floor below. The same bevels give the notching out of string to fit over

Fig. 4.

A, Pitch-board as applied on String. B, Bevel for Floor. C, Joint for Skirting.

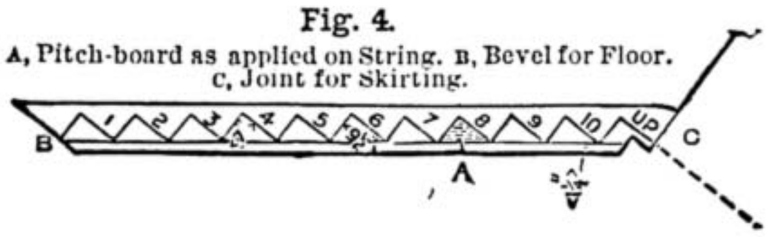
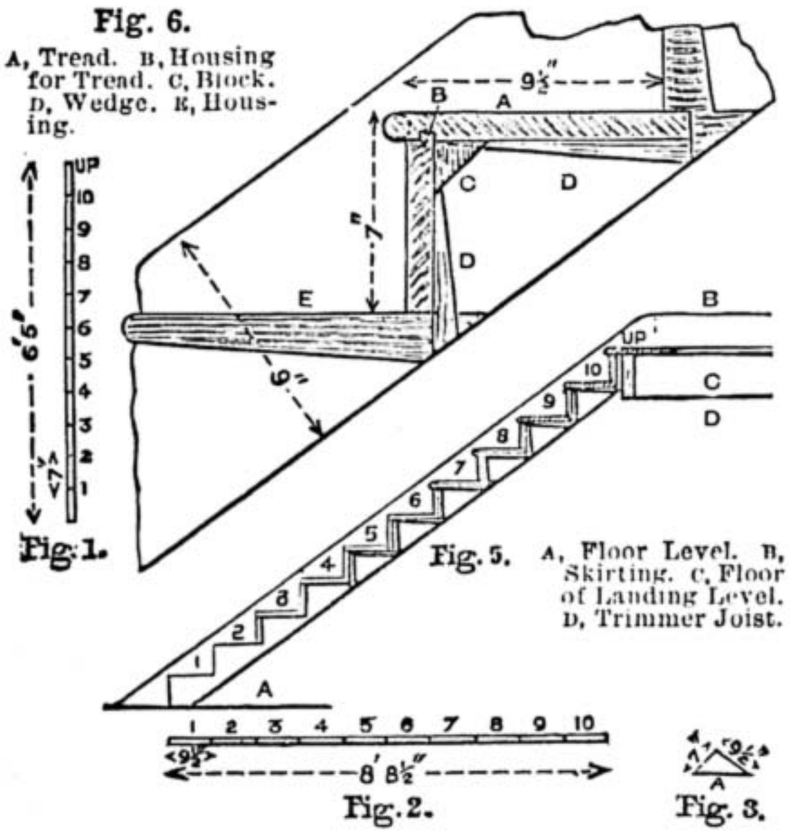


Fig. 6.

A, Tread. B, Housing for Tread. C, Block. D, Wedge. E, Housing.



Construction of Flight of Stairs.

trimming joist (Fig. 5), which string is now ready for marking and cutting the housings. If you look at Fig. 5, which shows the string in position, you will see that steps 1 and 2 are simply marked as in Fig. 4; but steps 3 and 4 have the thickness of treads and risers marked on. The treads and risers in this case may be out of 1 in. stuff, which will be about ⅞ in. finished. The next two steps (5 and 6) have the wedging shown, Nos. 7 and 8 show the complete housing with nosings bored out, and 9 and 10 show the treads and risers in place and wedged. Fig. 6 is ¼ full size section, showing more plainly how the stairs are put together, and with the size of wedges, etc., marked. After marking the string as in Fig. 4, set off below the line of treads and behind the line of risers ⅞ in. the thickness of same, then slide the pitch-board along the line before mentioned, and draw this thickness parallel to the existing face line of treads and risers. Now allow for wedging, and this will give the exact size or width of housings, which should be ½ in. deep. Cut out the housings for the treads within ½ in. of the face line of risers, as shown at B, Fig. 6, then bore with a ¾ centre bit a hole the same depth as housing, and this will give a sharp curve for the nosings to fit up to, which would have been destroyed by the saw if done before the rest was cut out. Now follow with the housing for the risers, taking care that the front of the saw does not knock against top edge of tread housing, which would look very unworkmanlike when your stairs were finished. The outer string should be now planed on both sides and treated in the same manner, care being taken that it is marked so that it will pair with the wall string, and they will now be ready for the steps. Now prepare your treads and risers as shown in section Fig. 6, cutting them to the exact length you require the width of stairs to be, allowing for thickness of strings after deducting depth of housings. You will notice that the treads are wider by the thickness of risers and projection of nosings than the 9½ in. going, and the risers are less the thickness of treads plus the tongue, which is fitted into treads. One tread and one riser should now be glued together as shown (Fig. 6) and blocked, keeping the blocks 1¼ in. away from ends, to allow for going into housings, and for points of wedges in fixing to strings. When the ten steps are glued up and dry, the nosings should be worked. It is better to leave this till now, because there is less likelihood of the round edges getting damaged, and you are sure of not making the mistake of rounding the nosings before you have ploughed for the risers. If you now lay the wall string on the bench or floor, and place the steps in the housings, and lay the outer string on top, taking care that the steps fit, and strut the whole together from the ceiling, or in any other convenient manner, you will at once see if you are all right, and all that remains is to wedge the tread of one step and the riser of the next, working upwards and cutting off the projecting end of wedge of riser or step, as the case may be, and so on to the end. Screw the back edges of treads up to risers, using plenty of glue with the wedging, and you will be all ready for fixing when the whole is dry. The strings might with advantage be 11 in. wide instead of 9 in. if strength is required, and in that case the line on which you set the pitch-board should be about 2 in. from the edge.—E. D.

Sal-Ammoniac.—S. J. (*Birmingham*).—Your query is rather vague. You ask, What is the sal-ammoniac that tinners use to get the bright flush on their work, such as saucepan handles? and so on. Well, there is but one kind of sal-ammoniac that I know of; that is the ordinary sal-ammoniac or chloride of ammonium of commerce, the same as is used for electric bell. The articles to be tinned are pickled in a bath of hot acid till sufficiently clean, then run through killed spirits, in which a lump or so of sal-ammoniac has been dissolved, and then into the tin bath, which is kept well supplied with sal-ammoniac. When thoroughly tinned they are lifted out, and the superfluous tin shook off or wiped with tow, according to the necessities of the case, and cleaned in sawdust. Copper moulds are, of course, not done in a bath. The tin is poured on to them, swilled round and out again till properly tinned, then drained, cleaned, and polished. I should think that in your town you would have no trouble in getting practical illustrations of what you want to know.—R. A.

Bookcase.—FRISBY.—Your sketch, though rough, is quite sufficient for the purpose, as it shows better than words alone could do what your idea is. I presume you intend it to stand in a recess, in which case the 1½ in. you have allowed is ample—too much, in fact, if you want to make a close fit. You, however, give the dimensions on the bottom where it is to stand on the cabinet on which you intend to place it; and in setting out the width you must take into account the skirting board, if any, which runs round the walls. I am also not clear whether you intend to put a cornice or moulding on the top, and, of course, if you do you must allow for this. As regards thickness of wood, 1½ in. stuff ought to be sufficient for ends and shelves, while a little less may be used if preferred for the other parts; pine will do very well. Your best plan will be to make the two drawer boxes separate from the upper part or case, which should be complete in itself. Fasten this to the drawer boxes by screws, as may easily be done by removing one of the drawers for the purpose. Fasten all tops and bottoms to ends by means of the ordinary lap dovetail, unless you prefer to adopt the simpler method of nailing the parts together, as suggested in the articles on "Artistic Furniture." A perusal of these will, no doubt, be of assistance to you, not only so far as construction is concerned, but by indicating how you may improve the appearance of your bookcase.

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I may also say that an article or two will shortly be devoted to the construction of a bookcase as one of the pieces of easily made artistic furniture; and, unless you are in a hurry, it may be advisable for you to wait till they appear. Unless I am very much mistaken, you will find all the points on which you may now be in doubt thoroughly elucidated. The pieces between the drawers—the bearers—may either be nailed or grooved into the ends. Read the remarks about drawers in the articles on the bureau which have appeared in these pages. No, the back need not be panelled, though, of course, this is the best form of construction. For such a piece of furniture as yours I should, however, advise you to use a munted back, or even match boarding. We shall be happy to help you on any other point you may require advice about.—D. A.

Prospects for Young Workman.—CABINET MAKER.—Yes, I can certainly tell you of one publication of special advantage to young cabinet makers, and I know many experienced hands who take it regularly with benefit to themselves. Its name is WORK, and though, as you are aware, it does not confine itself solely to the cabinet-making craft, I do not think you will find the same amount of useful information, both of a theoretical and practical kind, elsewhere. With regard to other books, much must depend on whether you want to be thoroughly well read on all that pertains to your trade, or are content with having a good general knowledge of the joinery part of it. In connection with the former intention, you will find no book treating of decoration or applied art beneath your notice. Read everything you can get hold of in which woodwork is referred to, and a good many where it is not will be of service, for example, Ruskin's "Stones of Venice," "Seven Lamps of Architecture," etc. Pay special attention to works, both historical and practical, treating of carving, turning, marquetry cutting, polishing, and similar correlated trades. The works of Chippendale, Heppelwhite, Sheraton, and other noted cabinet makers of the last century, will be of use to you. Books on architectural matters sometimes contain hints, though in knowledge of the practical details of cabinet making you will often, if not generally, find architects very deficient. For a general insight into the principles of "art" furniture, I cannot do better than recommend Eastlake's "Hints on Household Taste." There are also the two trade papers—*The Cabinet Maker* and *The Furniture Gazette*. As there is nothing in your inquiry to indicate where you live, I am unable to say whether the information that you will find all the books named, and dozens of others equally useful, in the South Kensington Museum Library. You need never expect to master the whole subject, but you may vastly improve your knowledge by attention to the foregoing hints. I have been studying the literature of furniture for the last twenty-five years, and though I may, in consequence, know a little more than would otherwise have been the case, the subject widens yearly, monthly, daily. There is always something more to learn, so if you want to be a thorough student of furniture you see what you have before you. Your other questions are somewhat difficult to answer definitely, as so much depends on your personal ability, habits, and other circumstances of which I am ignorant, and which you yourself cannot foresee. With exceptional skill and business ability, you may, of course, greatly improve your position, but assuming you are a good average worker, steady, and obliging, I think it may fairly be said that the prospects are as good as in any other trade. If you remain at the bench, you may take it that the wages will be from 27s. to 40s. 6d. per week; at least, that is what they now range from under "Society" rules, and, of course, they may alter. They are, however, not likely to go lower. The rates vary according to the locality. Thus in London 40s. 6d. is now the figure, 27s. being for districts where expenses of living are less, so that, taking all things into consideration, it is a question whether the cabinet maker earning 27s., say, in the Isle of Man is not as well off as the cockney with his 40s. Perhaps the average rate may be given as about 34s. One great advantage a good workman has over others is that he is more likely to be constantly employed. No; on the whole I don't think it can be said that one branch pays better than another. A good deal depends on fashion. For example, when "turned spindles" were all the rage, the turners to the trade had a good time. Later on fret and marquetry cutters had their innings, but things all round soon get equalised. Ability to turn your hand to anything connected with the trade, such as the above arts, carving, polishing, upholstery, would make you more valuable, especially in country towns, but you must distinctly understand that you cannot hope to become so proficient in more than one branch as to compete successfully in large towns with those who have made it their speciality. As "fitter" you might command increased wages, but only experienced and thoroughly reliable men are able to fulfil the duties, so you must wait some years. The same may be said of foremanship. A knowledge of drawing will be of service, if not of actual necessity, to you. You should be able to make and understand a working drawing, and if you can also manage a small sketch so much the better. Of course you stand a chance of getting into a good firm. Why not? It depends principally on yourself. Without having the slightest idea where you are serving your time, what work you have been at, or anything else about you, how can I possibly say what wages you would have at first starting? I have known lads who, as improvers, have been well worth within a very few shillings of men's wages. These, however, are the exceptions. Others, perhaps the majority, are certainly not worth 20s. per week, while many of them would be dear at half that amount in a good general furniture factory. It really is a pity you have not given more particulars, as I might have helped you more. As it is, I have written at length in order to assist you, though I have done so a good deal in the dark, as you give so few of the necessary particulars. These are not wanted from motives of curiosity, as so many inquirers seem to think, if one may judge from the remarkable reticence displayed, but are positively necessary in most instances, if helpful answers are to be given. If the Editor and members of the staff are willing to give their best services, and take time and trouble in helping inquirers, surely these might respond by being a little more explicit than is sometimes the case. Speaking for myself, it is really mortifying not to be able to advise readers who inquire in "Shop" simply because, like you, the questions, though requiring a personal answer, are made in the most general terms.—D. A.

Quick Drying of Photo Negatives.—W. L. D. (*Louisville, U.S.A.*).—Yes, benzine may be used instead of methylated spirit, but I do not like it so much. For one thing, the smell is objectionable. As you say, however, it is inexpensive, and does not injure the negative, so that it may be convenient as an alternative. For the same reason ether may be mentioned as effectual for the purpose. Your other suggestion of placing the negative in the receiver of an air-pump, and then exhausting the air, seems a roundabout way of doing what is wanted, and not nearly so simple as drying with spirit. I have not tried your second plan, so cannot offer any further opinion about it. Glad, nevertheless, to receive your hints, which may be of use, and would have been attended to before but for the fact of your being at one side of the "ferry" and I at the other.—L. I. P.

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Machine for Current of Air.—YOUNG ENGINEER (*Newcastle-on-Tyne*) writes in reply to BELLOWS (see page 190):—"I think a small fan would give a powerful and steady current of air. I enclose you a sketch illustrating my idea. BELLOWS could make one if he is a professional, or even a good amateur, or any smith would make him one, at a small cost. Should BELLOWS want more particulars, I should be glad to give him any assistance I can."

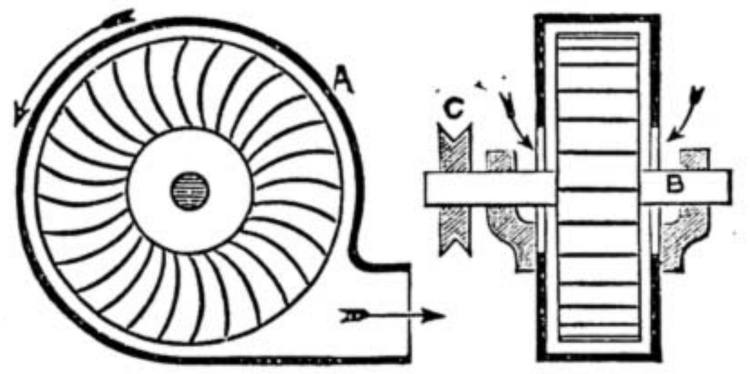

Fig. 1. Fig. 2.

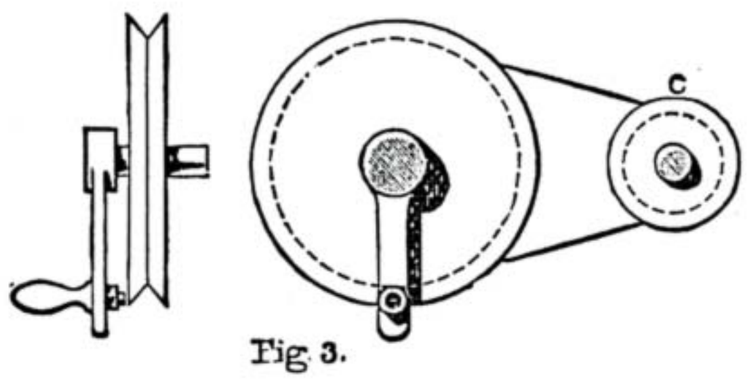

Fig. 3.

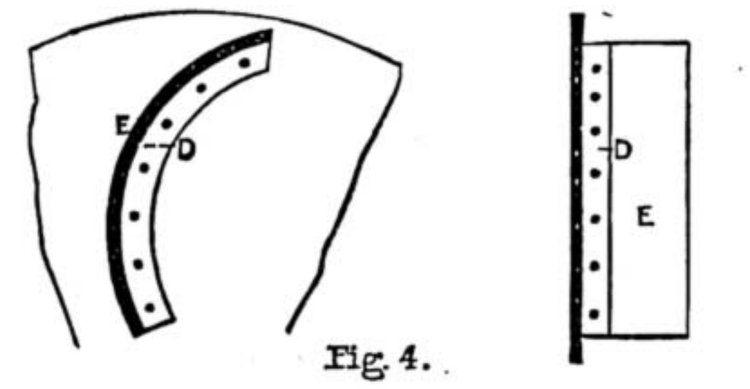

Fig. 4.

Figs. 1 and 2 show Section of Fan or Blower—A being a Sheet Iron Casing; B, Spindle on which the Wings revolve; C, Small Driving Wheel on Spindle. Fig. 3 shows Speed Arrangement. Fig. 4 shows method of attaching Wings to Plate—E being Wing; D, a small Angle Iron.

Repairing Ivory Stick.—B. A. B. (*Hampstead*) writes in reply to W. A. (*Hanley*) (see page 270):—"You had better try to mend your ivory stick with Marshall's Giant Cement, or Kay's Coaguline. There is also a new fish glue, of which good reports are abroad."

PRIZE COMPETITION.

THE Editor of WORK has the pleasure of informing his readers that the Examiners of the Drawings sent in by One Hundred and Fifty-two Competitors for the Prizes offered by MESSRS. CASSELL & COMPANY, LIMITED, for the Three Best Designs for a small Bookcase to contain 208 volumes of

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and the Third Prize of *Half a Guinea* to

Mr. S. J. SPELLER, Bay Cottage, Broadway, Frome, Somerset.

The Drawing sent in by Mr. J. H. WOOLFITT, 4, Crooke Road, Lower Road, Deptford, is highly commended.

*** The Designs by the successful Competitors will shortly appear in WORK, and each Design will be accompanied by a brief paper explaining its construction, with hints and suggestions with regard to materials, finish, &c. Many of the drawings submitted gave evidence of originality of conception, ability of expression, and considerable skill and proficiency in drawing in those who executed them, and the Editor of WORK sincerely hopes that disappointment in the present instan e will tend to stimulate those who have failed to fresh efforts in the future, which, through perseverance and steadiness of purpose, will not fail to produce the ever welcome fruits of success. Indeed, the Editor regrets that there were not more prizes at his disposal, as a great number of drawings, though not so good as the successful designs, were well worthy of pecuniary reward.

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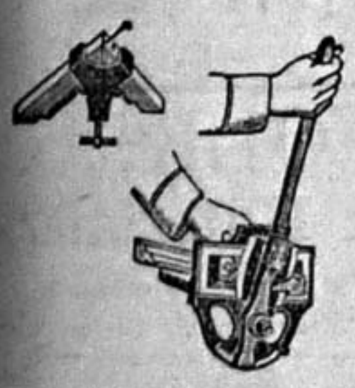

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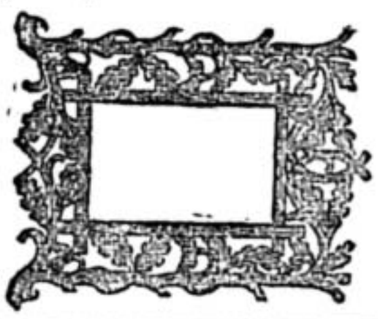

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NERVOUSNESS IN MEN

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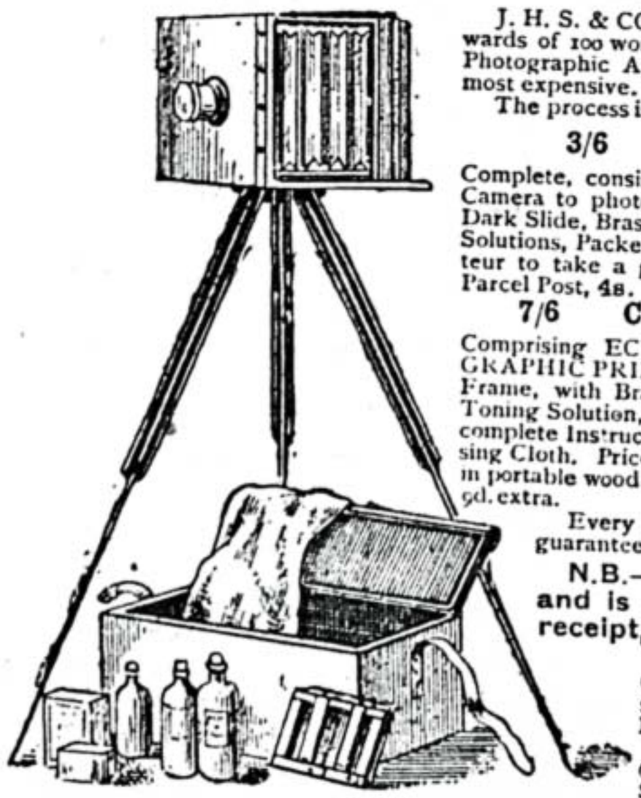

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